THE
ELECTRICAL REVIEW

Volume CXXVI. No. 3258

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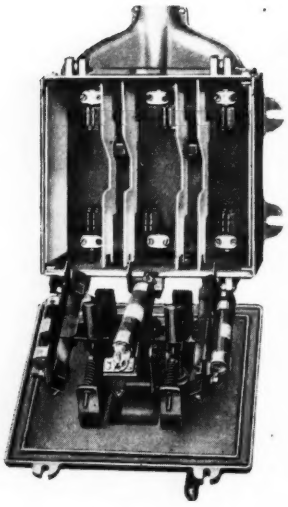

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THE
ELECTRICAL REVIEW

THE OLDEST ELECTRICAL PAPER — ESTABLISHED 1872

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The Second War Budget

Effect Upon Electrical Investments

THE rapidity with which, in these war-days, time marches on, is illustrated by the fact that the Budget of April 23rd has already passed into history so far as Stock Exchange markets are concerned. The actual opening of its avenues gave a sensation akin to relief. The greatest enemy to the spirit of financial enterprise is any feeling of uncertainty. Seeing that at no time can complete assurance be claimed in financial affairs, it is obvious that uncertainty, in greater or less degree is, like the poor, always with us. Another fact equally clear is that any wartime Budget is liable to be shortly succeeded by another. Times change, and Budget demands with them, in quicker succession during a war than in days of peace.

Little Damage to Credit

Admitting all this, it can now be said that the latest Budget establishes certain broad principles. In its purpose of spreading the burdens over all classes of the community, the Budget succeeds in doing an amount of damage to credit that seems astonishingly slight when matched against the colossal total of money that it claims for war purposes. The old and invariable experience that any increase of taxation has an immediately depressing influence upon the Stock Exchange prices of British Government, Home Corporation and fixed-interest securities of every kind is a thing of the past. The present Budget had a directly contrary effect. Gilt-edged issues have come into renewed demand. To some extent this may have been due to the absence of new additions to income tax, although the point of income at which sur-tax is imposed was lowered. Increased taxes upon tobacco, spirits, beer, etc., had been generally expected. In what manner the new Purchase Tax will operate is too uncertain for it to be of more than academic interest for the time being. Extra postal and communication charges were accepted with the shrug of the shoulders that says "We are at war."

The outstanding novelty in the Budget, and the focus of financial interest is the limitation of dividends upon ordinary shares in companies not connected with clearly specified branches of industry. Companies are not to be allowed to declare a higher rate of dividend on their ordinary shares than the highest paid in any of the three years starting from July 1st, 1936, and ending on June 30th, 1939. Where a company, having paid no dividend of late years, has recently entered upon the profit-earning stage, a dividend up to 4 per cent. is to be allowed upon its ordinary shares. Provision is made for exceptional cases to receive consideration.

The effect of the Budget is to increase the security of the issues ranking ahead of ordinary capital. Harshly as it presses upon holders of ordinary shares in companies that were expected to pay higher dividends than any distributed within the three-year period—Johnson & Phillips is a conspicuous example—the result of this clause is to strengthen the reserves of industrial or other undertakings. Sir John Simon said he hoped that surplus earnings would be applied in support of Government war loans, nor is his confidence likely to be misplaced. But the point is that where shareholders are prohibited from receiving what would otherwise be distributable earnings, those profits will now go to buttress the financial stability of the company, and thereby enhance the value of prior charges, debenture stocks, preference shares, and the like. From this, it is an easy and a natural step to the fact that the same plan acts as a fresh plank to fortify the structure of national finance. It adds security, and, therefore, attraction, to British Government loans. It sends money into such issues as those of Central Electricity and other "Board" stocks. It removes the apprehension of likely depreciation of preference shares in any sound undertaking.

Bonus Issues Banned

The further prohibition in the Budget that forbids the issue of bonus stock or shares is one which strikes at the prices of British Electric Traction deferred, and others whose market value has depended in the past upon the allotment of new stock by way of bonus. Such allotments have frequently been worth more than the actual cash dividends. The matter as it concerns the British Electric Traction Co. is discussed in our "Stocks and Shares" article on page 511.

Electricity supply companies, not having been expected to advance their dividends during this war, their shares were little affected by the Budget. A few of the manufacturing and equipment companies—Johnson & Phillips have already been noted—were

thought to have some chance of paying a little extra, and the shares accordingly showed a hesitating tendency. But regarded as a whole the Budget, for all its increase of burden, has been so contrived that prices of stocks and shares have suffered surprisingly little, and the effect upon gilt-edged investments has actually been a fortifying of their security, a strengthening of their prices.

Engineers for the R.A.F.

THE Air Ministry is calling urgently for technical officers for employment on engineering, armament and signals duties. Applicants should be between 21 and 50 years of age and possess certain technical qualifications; the requirements vary according to the branch of the service. In general, the types of men required are holders of engineering degrees or special educational qualifications, combined with practical experience. Engineer officers are required to have had experience in i.c. engine or aeroplane construction; armament officers should possess practical engineering experience and knowledge of the properties of materials; and signals officers need to have had training and experience in telegraph and telephone work, preferably on the radio side. Candidates whose qualifications do not reach the standard called for by the Technical Branch may be offered commissions in the Administrative and Special Duties Branch of the R.A.F. Volunteer Reserve. Men desiring to take up commissions should apply to the Air Ministry, S.7.e.5, Adastral House, Kingsway, W.C.2, giving full particulars of their qualifications, training and experience.

Exemption for Students

IN January of this year Professor Kapp drew attention in our columns to a serious risk of shortage of fully trained electrical engineers in the near future, temporary exemption from military service being given only to final-year students. The risk has now been lessened, following consultations between the Ministry of Labour, the I.E.E., and kindred bodies by the inclusion in the Schedule of Reserved Occupations of student engineering apprentices or learners at and above the age of eighteen years. The new arrangement applies to any engineering student who produces a certificate from an approved training authority that he is within two years of offering himself, for the first time, for an engineering degree (or equivalent), a higher national certificate or associate membership of one of the senior engineering institutions. It should be noted that the new arrangement does more than give an extension of time for completion of studies; it recognises that the student who has made some progress in his training should not be permitted to enlist. The conditional exemption does not, however, relate to men who are now in the Forces or who have received their calling-up notices.

Towards Zero Temperature

EACH year the Kelvin Lecture presents an opportunity for electrical engineers to gain an insight into other aspects of science that are, nevertheless, related to their own work as comprising the raw stuff of its future development. An additional benefit it confers is the fostering of self-confidence in the ability to grasp fundamentals that often appear to be abstruse only because the methods of experiment as well as of expression are unfamiliar. What is wanted, as Dr. C. G. Darwin said last week, is a feeling for the subject even more than an aptitude for mathematical reasoning. The subject of this year's Lecture bore an especially close relationship to the work of Kelvin, since the enunciation of the principles of thermodynamics, which remain almost as he left them, were certainly among his chief contributions to scientific knowledge. Is it worth while, as Dr. Darwin asked, to pursue yet further the quest for absolute zero temperature when each small advance is made with increasingly greater effort and yields less and less result? The engineer's answer is an affirmative. His natural wish is to clear up a situation in which, for example, no constancy can be attached to specific heat, chemical reactions disappear, ohmic resistance ceases and properties of metals seemingly change in an unaccountable manner; indeed, temperature itself comes to have little real meaning as it cannot be measured. His hope, too, is that the quest will prove to be something more than an adventure of the mind. The history of research shows that those seeking a far-off goal have discovered much of utility by the way.

Telling the Public

OUR last week's leading article upon the necessity for approaching consumers with great patience and simple statements when the delicate matter of increased charges arose was inspired by a newspaper criticism of the Central London Electricity, Ltd. We did not regard the criticisms seriously but felt compelled to mention the matter because of the harm such publicity was doing the industry. While we still hold to our contention that many supply authorities do not approach consumers in the right way, we believe the Company has done its best to remove any false impressions which consumers may have gained. Not one but several circulars have been sent impressing upon them that the flat rates would only be charged if they failed to sign and return the new two-part tariff agreements and the great majority have been satisfactorily settled on the new basis. The latest circulars —addressed respectively to domestic and commercial consumers—explain in some detail the effects of the war upon the fortunes of the company. It is shown, moreover, that even at the higher price electricity is no less worth while. The company is maintaining its hire and hire-purchase schemes and not charging more for the apparatus while existing stocks hold out.

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We ask readers to remember that the drastic rationing of paper means that there will be no surplus copies of trade and technical papers. They are therefore urged to ask their newsagents to reserve a copy of the "ELECTRICAL REVIEW" each week, as casual purchase will not be possible in future

Brighton and the J.I.C.

THE relationship of the Brighton Corporation with the Joint Industrial Council for the Electricity Supply Industry was again discussed at the Town Council's meeting last week. A resolution was passed declaring the intention of the Corporation to withdraw from the J.I.C. "unless financial safeguards to the satisfaction of the Finance Committee are obtained not later than June 1st." In the meantime the payment of the ½d. per hour increase to employees of the Electricity Department, decided upon by the National Joint Industrial Council, is apparently to be suspended after being in operation for two or three weeks. The argument was again put forward that the Corporation should not be told by an "outside body" what it should pay its employees but it was warned that this "splendid isolation" might lead to strike action. The electricity supply industry has been singularly free from labour trouble, thanks to the operation of the Joint Industrial Councils. If every undertaking becomes a law unto itself this happy state of affairs will not last much longer. Surely Brighton is better placed than many other undertakings who are loyally observing the award.

Tailpiece

AN evening paper reported a week or so ago that "a course of three lessons in wartime cokery for wives is is be held by Beckenham (Kent) Education Committee." There is a suggestion of "burnt offerings" about this—or is it a subtle move by the gas industry?

TURBINES FOR MODERATE HEADS

The Field of the Francis Design

By F. Johnstone Taylor

ALTHOUGH with the exception of the recently developed propeller-type runner the hydraulic turbine remains basically what it was twenty-five years ago when units of 50,000 HP were being seriously considered, there have been improvements in design and Britain and the Dominions are no longer dependent upon foreign-built machinery. Scotland is now producing a large amount of electrical energy from its water power which is by no means exhausted, the Shannon scheme has proved sufficiently successful to warrant proceeding with the second stage of its development, a smaller scheme near Dublin is being pushed forward and the scope for hydro-electric developments in the Dominions is extensive.

In point of capacity, the North American Continent with its Niagara and Boulder Dam works and big river schemes like the Wheeler and Norris Dams, and Russia with the Svir developments, attract perhaps the most attention. These are, however, national works, usually with river regulation, irrigation, navigation and water supply, and are more notable in any case for the large civil engineering works involved than for any special feature of the machinery, though from the mechanical standpoint many of them are of interest on account of the great strides which have been made in the design and construction of low-fall turbines of 40,000 to 50,000 HP.

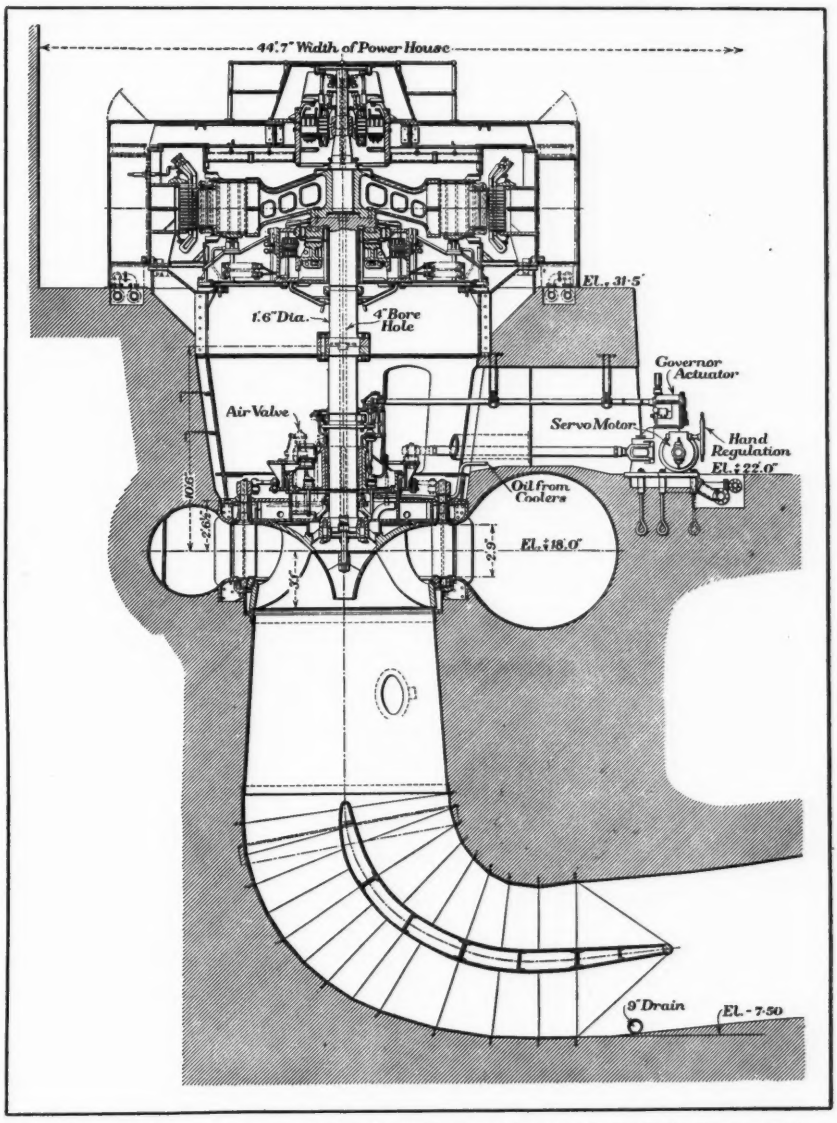
Where the development of electrical energy is the primary object the work usually has to be undertaken by private enterprise and is of more modest dimensions, like those in Scotland, India, Australia, South America, Central Europe and parts of Africa, though similar works in Scandinavia which have been singularly successful have been largely financed by the Government.

Future Development

With most of the world's high heads now acquired and at least partly developed and the large river schemes confined to countries like North America and Russia, hydro-electric work, though offering vast scope for achievements during the next twenty-five years, is to-day narrowed down to moderate or low-fall schemes calling for units of individual capacities somewhere between 10,000 and 30,000 HP and for such work there is a demand for better and cheaper machinery.

Admittedly the hydraulic turbine has long been a machine of high efficiency, 90 per cent. being not uncommon. As to the cost of incidental works, which depends upon the nature of the site, £25 per HP installed is quite a favourable figure and an expenditure of twice that amount may be justified. If the aim is to sell power at £5 to £6 per HP per annum in order to attract large industrial consumers, the profits are not large. An improvement of 1 or 2 per cent. in efficiency is important; speed is also important where compatible with efficiency, lightness, cheapness and simplicity of construction. Speed becomes one of the primary considerations in the case of low-fall plants and the development of the propeller turbine has largely made economically possible units of round 40,000 HP operating on heads of 50 ft. or less, though even then the speed may not be more than 100 RPM; its efficiency is high and, apart from the Kaplan type, it is not costly to build.

Compactness, essential in reducing the cost of the "setting" so far as reaction turbines are concerned, while partly dependent upon speed, also depends upon the ability of the designer to use steel—welded or cast—in place of iron for the heavier sections. The cast-iron scroll case which gave way to riveted steel construction is, to-day, a simpler and cheaper job when welded, and cast-steel runners for both impulse and reaction turbines have latterly become common. While setting a difficult foundry problem, corrosion-resisting steel is the logical means of combating the destructive effects of cavitation on runners which becomes more intense as attempts are made to get the last 1 per cent. of efficiency or a few extra RPM out of a low-fall turbine.



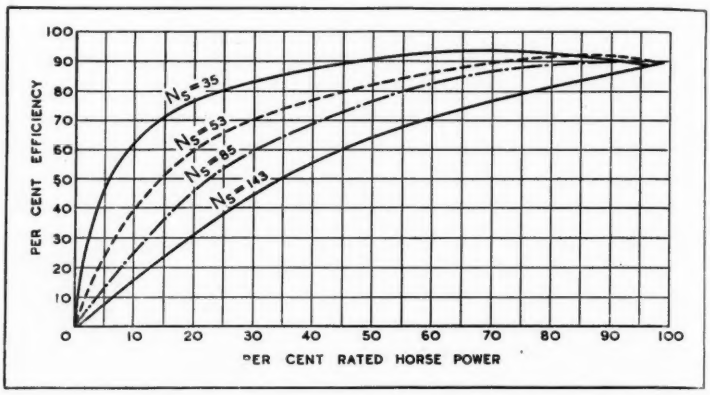
Vertical shaft, scroll case, 17,000-HP, 214-RPM, 114-ft. head (English Electric Co.)

Broadly speaking, reaction turbines can be classified as single-runner vertical-shaft, twin-runner horizontal shaft, and propeller types, though single- and double-discharge runners are a feature of cased horizontal-shaft machines for high heads, but it is more appropriate to deal with these along with Pelton wheels for similar head conditions.

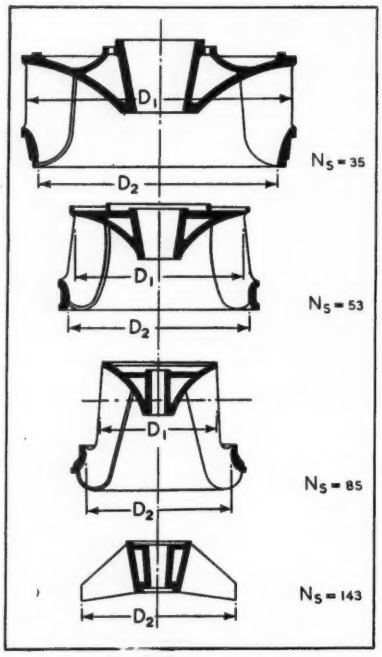
Seeing that for a comparable duty, say, 20,000 HP on 150 to

200 ft. head, a twin-runner horizontal-shaft machine (which is a feature of the Scandinavian hydro-electric works) does away at one stroke with the "setting" and thrust bearing, it might be argued that the vertical-shaft type perpetuates a crude design in which, while the electrical equipment is accessible enough, the turbine and control are not and a standard generator is inapplicable. Many years of experience, however, have proved it to be simple, compact, economical of space and efficient, and although the concrete foundations are costly, they make for rigidity. As subsidiary parts like the governor and pumping unit and control valves are on different floors perfect alignment and rigid connection between the electrical and hydraulic machinery is difficult to maintain.

In this direction an advance in design is claimed by the English Electric Co. in some of the turbines which it designed for works in Scotland. Here, as an extension of the generator plate, is a steel barrel permanently connected to the bottom of the turbine speed ring and embedded and anchored into a concrete pedestal surrounding the turbine. Rising from the power house floor with which it is strongly interlaced, it is provided with three or more large access ducts traversing both pedestal and barrel. Through them the turbine can be easily inspected from the single power house floor and all the subsidiary equipment can be compactly arranged close to the turbine. This barrel transmits the weight of the generator through the cast-steel speed ring of the turbine to the foundations below it and it also takes up the short-circuit torque.



Below: Runners of equal power but different speed. Right: Performance curves of runners



The Francis turbine runner taking in its water radially around its whole periphery and discharging it axially in the reverse manner to a centrifugal pump is, in the case of some high-head horizontal-shaft machines, not unlike a centrifugal pump impeller. It has undergone little radical change in its basic form since it was introduced more than fifty years ago by J. B. Francis. The principal difference between different runners of the same genus is that dictated by head conditions.

In the diagram indicating the performance curves of runners, the curve in which the specific speed Ns=53 is that met with in medium head turbines operating with 150 ft. head or so; Ns=85 relates to a low-head runner suitable for heads of about 75 ft. and Ns=143 to the propeller type now generally used for low falls under 50 ft. The diagram depicts runners of equal power drawn to the same scale.

Specific speed (which must not be confused with actual speed) is the basis on which runners of reaction turbines, whether of the Francis or propeller types, may be compared. It is the speed of a geometrically similar turbine, capable of developing 1 BHP under a head of one foot. Where N=the actual RPM, P=BHP and H=the fall in feet, Ns (the specific speed)=$N \times \sqrt{P} \div H5/4$. Two important conditions arise in connection with this formula. One is that with low heads, in order to obtain the relatively high rotational speed of 100 RPM a large machine must be equipped with a runner of high specific speed, that is in all probability a propeller-type runner, though not necessarily so.

The efficiency of the high specific-speed runner will reach 90 per cent. only at full power, dropping to 65 per cent. at half load, but the low specific speed runner is little affected. That, however, is no argument against the propeller-type runner as a whole. Being cheap to build and efficient at full load, it is the best for base loads. If the plant, as many low-fall plants now do, combines propeller-type units with those of the Francis type like the Shannon works, or is equipped with the appropriate number of Kaplan machines which, by a movement of the runner blades to adjust their angle, can maintain efficiency at part gate, it can be operated at a high overall efficiency under the variable head conditions which pertain at most low-fall plants.

A propeller-type runner may be cast in one piece or built up in the manner of a ship's propeller, though the former is much the more usual practice and is a simple foundry matter. Some builders have constructed machines with shaped blades, but this presents a difficult foundry problem. From considerations of strength most large turbines of recent years, especially those built in Europe and America, have been equipped with cast-steel runners, but bronze is frequently used for runners of high-head cased machines.

Stainless steel has also been employed to guard against cavitation effects. By extensive model experiments, on which most large hydraulic turbines are now designed, this condition can to some extent be avoided by the designer and especially by a scientific lay-out of the draft tube. Repairs to ordinary cast-steel runners are not difficult to effect by welding, but the use of nickel irons has not proved successful.

In Sweden a common practice has been to cast steel-plate vanes into a cast-iron or steel crown and rim. This practice was adopted by the English Electric Co. for the 7,000-HP unit installed in Lanarkshire. The same company has found effective the plating-up by welding on stainless steel to the areas susceptible to cavitation. One advantage of the plate-vane construction is that by forming the vanes in dies they can be made very smooth with streamlined edges and some weight is also saved. Since for maximum efficiency the form of the bucket must be as nearly mathematically correct as possible, the casting of any turbine runner in steel is exceedingly difficult.

Twin-runner Horizontal Turbines

While the horizontal-shaft Francis turbine is more to be associated with cased construction for high-head work, local conditions, and even perhaps the policy of a particular designer may favour the twin-runner horizontal-shaft type cased or in an open setting for conditions otherwise generally suitable to a vertical machine. It is a design which has been consistently adopted by Scandinavian builders for 5,000 to 30,000 HP turbines for moderate-head work and certain factors influenced its choice for the two Boving units at a power station in the Grampians, which develop 24,000 HP on 160 ft. head at 300 RPM. A turbine of this type is readily accessible from the power-house floor and the twin runners with their single discharge are in axial balance. The casings which here are simple iron castings could, to-day, be quite easily fabricated from relatively light-gauge steel though not perhaps with the same smooth internal surfaces or durability.

The two runners are cast in stainless steel as cavitation was anticipated by reason of the comparatively high suction head While the suction head is under the control of the designer and rarely exceeds 15 ft., operation at a comparatively high value, although tending to increase the risk of cavitation, facilitates the installation as a whole and may cheapen it without detracting materially from the efficiency. The links have been designed to break as soon as the load on any one guide vane exceeds a predetermined figure, so that if one of the links fractures the guide vane itself will neither be able to turn completely round nor foul the neighbouring one. For reducing the running clearance the runners have copper rings on each side of the guide apparatus corresponding to the neck rings of centrifugal pump impellers.

FRENCH RURAL EXPERIMENT

The Electrification of Magnet

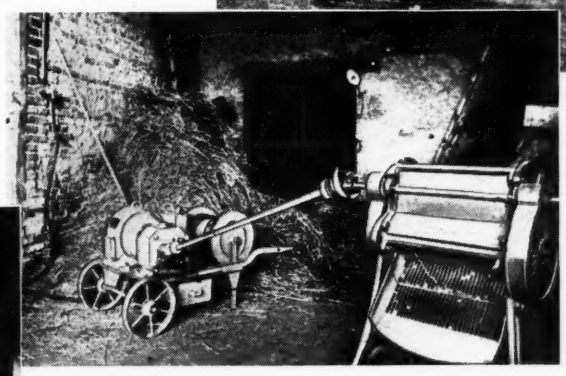
By S. H. Kahn

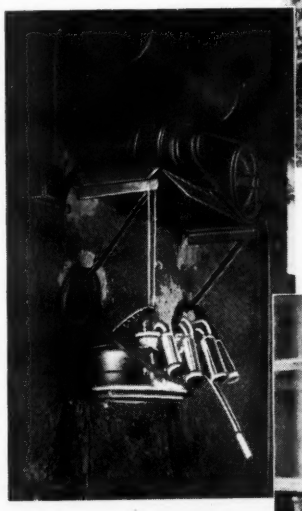
THERE are certain names which seem to indicate a predestination. One of these is Magnet, a village of 650 inhabitants in the south of France, whose name certainly suits it to electrical experiments, such as that which is now in progress there. At the end of August there were over 60 electricians at work on the installation of new power lines and wiring. General mobilisation reduced this number to two, but the realisation that the war was going to provide a remarkable field for rural electrification experiments, particularly in view of the shortage of farm labour, induced the Syndicate for the Electrification of the Department of the Allier to proceed with the scheme. After considerable delay the installation was completed, and the experiment will continue until December 31st next.

Covering as it does an area of 3,160 acres Magnet is not, in the true sense of the word, a village, but is rather a collection of farms and some small dwellings. Roughly a third of the population comprises farmers, another third are farm workers, and the remaining third are artisans, shopkeepers, &c. Before the experiments started 182 of the 194 families already had light and one farmer had a small electric motor. Several families also had certain small domestic appliances. The point of the test is to determine to what extent this consumption can be profitably increased by the wider use of motors, appliances, electric cooking and even water heating. As there is no water supply a scheme was drawn up and was to have formed part of the experiment, with water heaters installed in several farms. The war, however, made it necessary to abandon this part of the project. When the scheme was suggested to the inhabitants of the village it was well received, and the great majority expressed willingness to take part. In fact, however, war reduced the actual number of participants to 49 families.

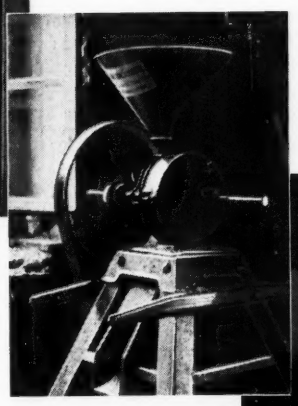
All the manufacturers of both domestic and farm appliances, as well as motors and larger machinery, were asked to co-operate by lending such material as might be required, and the consumers were left a perfectly free choice both as to the type of apparatus and the manufacturer. Thus the 48 cooking appliances include eleven Alsthom ranges, six hotplates and three ovens; five Arthur Martin ranges; three mixed ranges for electricity and coal, one oven and two hot-plates; two Chaboche ranges; four Caloria ranges and two hot-plates; and nine Scholtes ranges. The remainder of the domestic appliances consist of five Mors vacuum cleaners, one Paris Rhone vacuum cleaner and four Mors floor waxers. It is interesting to note that these last appliances have, for the most part, been taken not by individual consumers but jointly by two or three families.

Above: Electric thresher at work





Above: Mobile motor connected to a fodder chopper. Left: Electric milker on the farm of M. Senneret. Below: Grain grinder for fodder



Small Alsthom cooker in a kitchen at Magnet

Apart from the domestic appliances, three families have installed water pumps to provide themselves with running water from wells and two have Frigidaire refrigerators.

Farm implements include two electric milkers, two churns, seven cream separators, five log saws, six feed mills, and one butter kneading machine. The local baker has installed a motor on his dough mixer, while nine farmers have motors for miscellaneous uses, mainly of the mobile type which can be installed where needed. They range in capacity from about ¼ to 15 HP, most of them being of about 2 or 3 HP. The cabinet maker has installed a sanding and planing machine, while the local building contractor, who has a small machine shop, has installed a forge blower, an electric metal saw, a mortising machine, a polisher, and a drill. They operate on DC and are fed through a converter set.

As can be seen, the material permanently installed is extremely varied, but besides this the Syndicate has also undertaken electric threshing during the autumn, using a Breloux thresher with straw baling press and sheaf lift built in, lent by the manufacturer. For test purposes special metering apparatus has been provided to give exact consumptions and loads during the work. It is also intended to borrow electric ploughing machinery.

Five small substations existed in the commune before the beginning of the test. They were totally inadequate, however, so

that they, like the whole low-voltage distribution system, had to be rebuilt. A supply at 10 kV is obtained at Varennes, and is stepped down at the rebuilt Magnet substations to 230/380 V. Each of the substations now comprises a 50-kVA transformer of the usual rural type, demountable and replaceable within a day. It is installed in a small cabin, which also contains switch and fuse equipment for the transformer, and a clockwork mechanism for the street lighting system. This had been completely installed before the war was declared, but has not been used.

One other communal installation is that in the local school, where tubular heaters totalling 5 kW have been installed for the heating of one of the rooms. It is admitted that this installation is rather one of demonstration than of practical use, since the cost of electricity, even at the cheapest rates, is such as to render heating economically impracticable, except as an occasional addition to some other system. The method adopted is direct heating by large-diameter heating tubes fixed to the walls of the classroom.

Low-cost Threshing

As regards results, it is a little early to say much. The threshing machine, operated by a motor rated at 14 HP absorbed 6.5 kW when running idle and 12 kW at normal load. The speed of threshing was between 20 and 25 sheaves per minute, the output in grain naturally varying considerably according to the quality of the sheaf. Over the whole period the machine threshed about 2,500 cwt. of sheaves. The total consumption amounted to 428 kWh, of which about 20 kWh was used in starting up and miscellaneous tests, so that the actual threshing took about 400 kWh, or about 154 Wh per cwt. of harvested sheaves. The cost works out at just over ¼d. per cwt. It is pointed out that these results were obtained with a new machine which had not yet been run in and was being operated by inexperienced men.

Interesting also are the results with the cooking appliances. Here a particular difficulty is that much French food is simmered for a considerable time at very slight heat. To overcome this the Syndicate has advised housewives to make wider use of their ovens. Simmered dishes, instead of being cooked on a hotplate, are started on the range, then put into the oven.

Gas Competition

Immediately the electrical campaign was announced salesmen of butane gas cooking equipment visited the village and engaged in considerable free distribution of ranges. The result is that many families now have the choice between electricity, gas and coal for their cooking, with the three ranges one next the other in the kitchen. It has been found, however, that gas is not having any success, little use being made of it, while electricity is proving increasingly popular.

The experiment is similar to others that have been made. The Syndicate, however, has acted as an intermediary between the customers and the manufacturers of apparatus and appliances. Thus all the contracts for the loan of appliances are between the manufacturers and the Syndicate. The consumer undertakes to install the apparatus at his own expense (which has been reduced to the minimum) and to keep it in good repair.

Tabulated data in respect of each householder has been prepared giving the number of rooms, lighting load, size of meter installed, apparatus installed and consumption before and during the test. Details are also given of the area of farm land, the crops raised and their average yield, and the description of livestock. Space is left for a list of agricultural apparatus desired.

The experiment at Magnet differs from that at St. Hilaire-sur-Helpe, made some time ago, in that Magnet is a particularly scattered area in which a considerable length of distribution line has had to be provided, whereas St. Hilaire was much more compact.

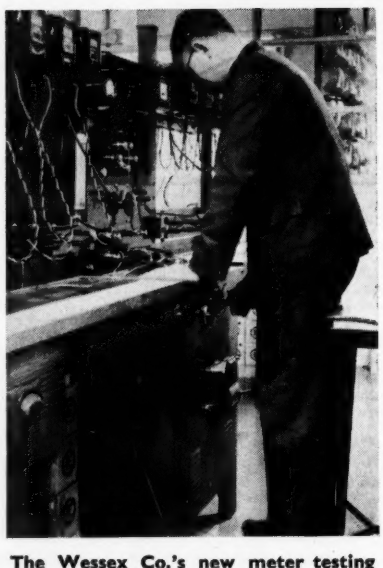
Meter Testing

Arrangements at Newbury and Salisbury

IN his article "Certification of Meters" in our issue of January 26th, Mr. S. H. Richards referred in some detail to the meter testing facilities recently provided by the Wessex Electricity Company. Since this was published we have had an opportunity of visiting Newbury and Salisbury to see the arrangements for ourselves and to hear from Mr. L. B. S. Golds, meter engineer to the Edmundson Group of companies, a little more of their aims and objects.

There are in the Wessex Company's 4,000 sq. miles about 150,000 meters and about 40,000 to 50,000 have to be tested each year. All the single-phase meters in the southern half of the area (south of Andover and Devizes) are handled at Salisbury, while the remainder of the instruments, including all the polyphase meters, are dealt with at Newbury. The new testing station at the latter place described by Mr. Richards is not yet actually in operation, but we were able to get a good idea of the ultimate layout of the building and were particularly impressed by the attention to detail.

While costs have been reduced to a minimum, every care has been taken to eliminate all factors likely to interfere with the maintenance of a high and consistent standard of accuracy. The ingenious method of keeping a daily check on all rotating sub-standard meters simultaneously by means of a relay operated from a standard laboratory clock were referred to by Mr. Richards, but he did not mention all the precautions taken to obviate dust and sudden changes of temperature. For example, although there are double doors at one end of the building in order to admit large pieces of apparatus, these are normally kept closed to provide an air lock. The windows, too, are situated so as to avoid cross-draughts, and provision has been made so that the exhaust fans at each end can be replaced by air-conditioning plant if this is thought desirable later on. The pivot and jewel cleaning room is located at the farthest point from the loading bay and the battery room. All the floors are of material which is easily kept clean.



The Wessex Co.'s new meter testing station at Newbury, showing the loading section of a single-phase meter test bench

The planning of the building on one floor ensures a steady flow of work and there would be no difficulty in installing a conveyor system if it was required. The location of all the wiring in floor ducts will facilitate adjustments and alterations of layout and the end wall backing on to the loading bay is built so that it can be removed when extensions are required.

At the Salisbury testing station, which is now complete, it is possible to see how smoothly and efficiently these ideas work in practice. Further examples of attention paid to detail are the height chosen for the racks, the spaces between racks in order to eliminate vibration, and specially designed screwed guide pins running in channel brass allowing any size of meter to be firmly held in a vertical position at any particular place desired on the rack. The testing arrangements at Salisbury are similar to those which will be used at the Newbury testing station and have been already described in Mr. Richards' article.

MASS PRODUCTION

Importance of Handling Methods

By D. Dyson Rayner, A.M.I.E.E.

THE term "mass production" has been widely used in the manufacturing industry during the past twenty years to indicate the production of any article in large quantities, as a result of which, it was assumed that its cost price, and ultimately its selling price to the purchaser, would be lower simply because it was the product of a system to produce an almost unlimited supply. Such a belief, however, can be a fallacy because unless manufacture is efficiently organised mass production alone will prove to be an expensive method of manufacture, and all industries are continually faced with the problem of how to hold down selling prices whilst at the same time they have to make a profit in the face of rising costs of material, labour and equipment.

It is recognised that the higher the rate which must be paid for labour, the more essential it is to ensure that labour is applied productively. Also, the higher the price which has to be paid for manufacturing equipment, the greater the need to secure its uninterrupted use as a productive agent, and finally, the higher the cost of materials, the more advantageous it is to minimise the time occupied in manufacture.

Only one solution appears to be available, and that is to lower production costs in order to absorb any or all of the above mentioned items, and this can be achieved by a study of the economical handling of materials. It has been stated that from the manufacturing point of view "the best handling of any material is the least handling of it"; consequently it is upon the correct application and use of suitable equipment that the future prosperity of the manufacturing industries may be said to depend.

Motor Factory Example

The electrical industry cannot be accused of having lagged behind other industries in this respect, for although manufacturers of light articles were the first to avail themselves of the advantages which accrued from the use of modern handling equipment, those engaged in the medium, and to a certain extent, in the heavy industries, are now applying comparable methods. To illustrate the value of this equipment, the handling system which is installed in a well-known AC motor factory is briefly described below. The essential points have been achieved by creating a constant flow of material from raw stock, through processing, to the finished motor. This flow serves as a pace setter for the subsequent operations, and is an important factor in planning machine tool loading and progressing.

Among the many advantages and economies claimed by the use of such a system of handling materials are: Output has been increased; production is better controlled and regulated; labour previously employed in non-productive work has been transferred to profitable operations; floor space which formerly provided wide gangways necessary for the passage of hand trucks has been reclaimed; capital sunk in stock has been reduced to the minimum; time required for manufacture has been cut down; better condition of stock is ensured; means for better control of quality have been provided; and risks of overlooked orders have been eliminated.

Conveying Castings

The various handling facilities for only part of an AC motor will illustrate the efficiency of the system. Cast iron motor frames enter the building at the receiving bay, on special open type vehicles. The castings range from 10 lb. to 4 cwt., and are transferred direct to inclined gravity roller conveyors which have been arranged to run up to the position occupied by the vehicle. The smaller castings are man-handled, while the larger ones are removed by means of an overhead crane. The respective conveyors are at varying levels to suit the weight and size of particular castings which travel along to the appropriate section for machining operations. On account of the distance between operations, the heavy castings are raised by a short inclined belt conveyor.

The inner stator core is assembled in the frame on an oil gear press, which is located to receive the frame from one conveyor and the core from another. The assembled unit is conveyed from this operation to the next by gravity roller conveyor and delivered at the proper working level. It is then elevated by means of an air lift, automatically operated by the frame unit itself in such a manner that as the frame rolls away, the lift descends in readiness to receive further units. The frame and stator core are then tack-welded while resting on the conveyor, after which the unit is rolled on to another lift to be elevated and sent rolling on to a live-roll conveyor, and thence to the stator winding operators.

Each frame is then placed in a special winding ring into which it slides directly without the use of any lifting device. At this point, prepared coils are inserted and the wound stator is returned to the roller conveyor and delivered to the connecting section where the coils are properly grouped, and electrical connections are welded while the stator rests on the conveyor. On completion of this operation, the stator passes through the usual tests and is then sent forward for impregnation. Here it is elevated by an air lift and hooked on to a continuous over-chain conveyor by means of which it is taken through several varnish dips and two baking periods at suitable speeds.

After impregnation, the stator is removed from the chain conveyor by another lift section, delivered by roller conveyor to the cleaning operation from which it is conveyed in a similar manner to an internal grinder. The finished stator then passes forward by conveyor to the motor assembly section at the correct working level.

Rotor Assembly

Meanwhile the rotor has been treated in a similar manner so far as the respective operations are applicable. The lengths of mild steel bars arrive in the building at another receiving bay, and are transferred from the vehicle direct on to a special rack provided with high-speed saws. The position of the latter is adjustable relative to the rack so that the bars can be lowered by gravity under the control of the operator, and placed into position for cutting the lengths required for making rotor shafts. The cut-off lengths are then conveyed to the appropriate section of the machine shop for turning and grinding, after which the core is pressed on as one unit and the complete assembly is ready to receive the winding. Whether the latter is of the squirrel-cage or wound type, the completed rotor is scheduled to arrive at the assembly section at the same time that the stator is being conveyed from the internal grinder.

The assembly section comprises three lengths of conveyors, two of which are power driven to take small and large machines respectively of standard construction, while the third is of the plain roller type to take those machines which deviate in general construction from the standard. From the assembly the completed motor is conveyed to the test department after which it is passed on by inclined gravity roller conveyor straight into the paint station which is in the form of a special cabin, and is automatically sprayed. It is then switched on to a power slat conveyor to finally arrive in the despatch department where the various motors are sorted into groups such as stock, local, road or rail transport, and transferred accordingly to respective conveyors.

At the end of each operation the work done is carefully examined by specially trained inspectors who stamp their reference in selected positions on the respective units when approved, and finally, the completed motor is not only subjected to the usual electrical tests to ensure that its performance is in accordance with specification, but also has to pass a further examination by an inspector who will certify that the machine meets the customer's requirements before it is passed out of the works.

Alternative Methods

Other manufacturers who have had to face the same problem of combating the rising costs of production have met the situation in a similar manner, although different methods may have been adopted. Some prefer the overhead monorail system for the transport of material as it saves space which would otherwise be occupied by conveyors, while other makers have adopted a combination of the two systems depending upon local circumstances.

The resultant product of any such system, embodying as described, critical inspection at every stage of manufacture, enables the purchaser to reap the benefit of lower production costs, standardisation of parts, and compliance with the appropriate technical specification. An electric motor manufactured on these lines is not just a "mass production" article, but one made under carefully organised production methods.

NEW BOOKS

Installation Textbook. Electrical Engineering Mathematics. Short-wave Radio

Electric Wiring. By W. S. IBBETSON. Pp. 264; figs. 136. E. and F. N. Spon, Ltd., 57, Haymarket, London, S.W.1. Price 6s.

This textbook first appeared in 1909, and the present is its sixth edition. A book does not reach a sixth edition without merit. Here it lies in a concise but inclusive presentation of the main essentials of electric wiring, in a form easily grasped by students and apprentices. It is a practical book, of the type welcome to practical teachers.

The first four chapers are devoted to theory, with numerous worked-out examples, calling for no more than elementary mathematics. AC theory is well treated, in particular. The rest of the book deals with practical work: distribution, wiring systems, testing, motors, and so on. It is well up-to-date—the chapter on illumination is excellent—and a useful feature is the repeated reference to the I.E.E. Wiring Rules.

The preface points out that practical ability can only be obtained in the workshop. This sound remark might have curtailed the lengthy treatment of jointing and soldering, which reflects the influence of earlier editions. A soldered joint is rare in a modern installation; in any case, its making is not to be learnt from books. Some of the detail of Leclanché cells and simple bell circuits, too, might have been replaced by something about fire-alarms, internal telephones, and radio wiring, which are not mentioned, though a knowledge of them is nowadays essential. Apart from these minor criticisms, there can be nothing but praise for this little book. —H. R. T.

Mathematics Applied to Electrical Engineering. By A. G. WARREN. Pp. 384; figs. 132. Chapman & Hall, Ltd., 11, Henrietta Street, W.C.2. Price 15s.

Many people incorrectly believe that improvement in applied mathematics means merely a growth in complication to keep pace with the problems to be solved. This is not so. Real improvement is simplification.

A. G. Warren's book should help to dispel erroneous ideas. The subjects dealt with are:—Complex numbers, vector quantities, symmetrical components; differential and integral calculus, partial differentiation, differential equations (including Legendre's and Bessel's equations), operational methods and operational calculus; electrical problems and electrostatic, magnetic and electro-magnetic relations; Fourier's series and harmonic analysis; conjugate functions and conformal representation.

The book is an addition to the series of monographs on electrical engineering edited by H. P. Young, and is of the same high standard as the other books in the series. Unfortunately, however, the subject is unlike the others in that it covers such a wide scope, as seen above, that it is impossible to develop it in one volume with the same degree of adequacy.

The result is that the book, although dealing, as the author says, with mathematics of a comparatively modest standard, would probably appear to a person not well enough acquainted with the subject to lean somewhat too far to the theoretical side. This is due to the fact that space was not available to deal with a sufficiently large number of practical problems to illustrate all the methods and treat all the problems. For example, the author deals with certain current distributions in thin plates but makes no statement of the practical use to which such methods can be put for finding the plate thickness (and hence extent of corrosion) from one side of the plate. Yet he has published an interesting article on this subject in the I.E.E. *Journal*. Within the mostly unavoidable limitations mentioned, however, Mr. Warren achieves his objectives very well.—A. J. G.

Short-Wave Radio. By J. H. REYNER. Second edition. Pp. 177; figs. 93. Sir Isaac Pitman & Sons, Ltd., Parker Street, Kingsway, W.C.2. Price 10s. 6d.

In view of the widespread use for radio transmission and reception of what are rather loosely termed "short waves," it is not surprising that a second edition of this manual, first published in 1937, has been called for. The new edition has not undergone any extensive alteration, though there are about fifteen extra pages of information. It opens with a glossary of terms used. The first two chapters discuss respectively the meaning of short waves and the propagation of wireless waves.

Fifty pages are devoted to aerials and the chapter on short-wave transmitters has been expanded. Modulation is next dealt with, and it is noted that the author has not deemed it necessary to extend the information given on the Armstrong frequency modulation system, which is now a subject of considerable interest in America. The chapter on receivers has been slightly expanded by some information on frequency drift and octode frequency changers, but the twenty pages allotted do not allow the author to make more than a cursory examination of this wide subject.

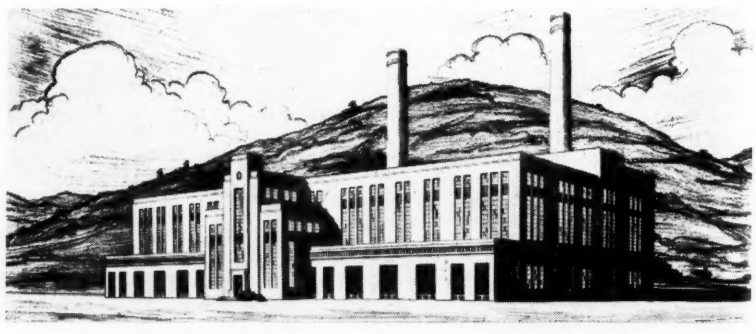
A chapter on the special advantages and problems of the ultra-short waves mentions television applications and, but for existing conditions, would have merited fuller treatment. The book concludes with some information on micro-waves (under one metre in wavelength). Throughout, it is clearly written and well-illustrated, and is a useful companion volume to the author's "Modern Radio Communication."—W. E. M.

Important Turkish Contract

IT is now possible to give details of the important contract which, as announced in our issue of March 15th, has been signed between the Turkish Eti Bank and the Metropolitan-Vickers Electrical Co., Ltd. It covers an electrification scheme including the construction of a power station at Catalagzi, on the Anatolian coast of the Black Sea. The order, which has been obtained in the face of international competition, has a value of approximately £1,500,000. The scheme has as one of its main objects the provision of electric power for the modernisation and expansion of the Turkish coal industry, and the site of the station has been chosen for its proximity to the Zonguldak coal basin. The plant will have a capacity of 60,000 kW and the company will provide switchgear, overhead line and three substations for a transmission system about 16 km. in length. Provision is to be made for future extension of the scheme.

The principal sub-contractors to the Metropolitan-Vickers Co. will include:—Babcock & Wilcox, Ltd. (boiler and coal handling plant); Holloway Bros. (London), Ltd., (buildings and civil engineering work, including cooling water intake); and British Insulated Cables, Ltd. (overhead transmission line and cables).

The initial generating plant will consist of three 20,000-kW 11-kV, 3,000-RPM turbo-alternator sets with Metrovick central-flow condensers and four-stage feed-heating incorporating low-pressure evaporators for make-up supply. Sea water will be used for cooling and will be supplied from a separate pump house to be constructed on the shore. Each set will include a 1,500-kW house-service alternator. A 375-kW Diesel engine set will also be provided for stand-by service to the auxiliaries. The station output will be stepped up to 66-kV by an outdoor transformer and switching station adjoining the power station. The main transformers will be 25,000 kVA, 11/16 kV, 3-phase units. The substation plant will include nine 6,400-kVA 66/15-kV outdoor transformers and 15-kV indoor switch gear.



Artist's drawing of the projected Catalagzi station

VERY LOW TEMPERATURES

Dr. C. G. Darwin's Kelvin Lecture

A FULL, but not overflowing, audience was attracted to the Institution of Electrical Engineers in London on April 25th to hear the thirty-first annual Kelvin Lecture delivered by Dr. C. G. Darwin (director of the National Physical Laboratory), who explained that instead of speaking of an electrical aspect of Kelvin's achievements he had selected what he considered to be the greater work which Kelvin had accomplished when he established the principles of thermodynamics. The lecturer's aim was to describe what was being done in a particular branch of physics, namely, the attainment of great cold, which in itself constituted an epitome of the subject of thermodynamics. He first developed what seemed to him the easiest way of acquiring a "feeling" for thermodynamics, so that one could foresee what was going to happen and not be compelled to trust to purely formal, though perfectly correct, mathematical reasoning. His method was to use statistical mechanics, a subject which was started in the middle of last century but which had only reached its full stature since the beginning of the present century. Its main development originated from Maxwell, Boltzmann and Gibbs, but Kelvin found it an entirely uncongenial way of looking at things.

Thermodynamics went far beyond the familiar principles of ordinary mechanics and an extra principle was needed to work it. The principle which he used was that of the equipartition of energy, first enunciated by Waterston, the keeper of a stationery shop in Edinburgh, in 1845, and again by Maxwell. Many had tried to find the proof, but no one had succeeded. The rule of equipartition implied the celebrated law of Dulong and Petit that the specific heats of equal numbers of atoms of different substances should be the same. This law held for most substances, but long ago certain puzzling exceptions were known. For example, the diamond had a much smaller specific heat than it should have, but at the end of the last century it was found that at deep temperatures the specific heats of all substances became very small, so the diamond only differed from the rest in that its specific heat started dropping earlier. This mysterious fact was later fully explained by means of the quantum theory, and arose from the rule that energy could not be taken up by the atoms in arbitrary amounts, but only in definite units. The matter was made a little harder to appreciate because it was not the separate atoms that constituted the units on which the energy was placed, but combinations of them in the form of elastic waves of vibration. The shorter waves that required large doses of energy were frozen out and got none, and the only ones that got energy were the longer ones which could accept it in small quantities. It was this effect which caused the specific heat to be much less at low temperatures.

Process of Cooling

The general process of cooling followed the same principle. The oldest way of producing cold was by the use of ice and salt; then by the boiling of such liquids as CO_2 or NH_3, and the production of a temperature of 160 deg. K. by Faraday in 1835, finally culminating in the liquefaction of oxygen by Olszewski in 1883. At the coldest nitrogen temperature, however, of about 60 deg. K., hydrogen would not liquefy, so that the last stage of liquefaction of gases called for a new method.

When a molecule bounced on the wall of the vessel, it came off at the same speed as it went on. If part of the wall was movable like a piston, slowly moving back, the molecules which hit it came off at the same relative velocity, and therefore at a reduced absolute velocity. This corresponded to the work done on the piston and the energy for this work was taken from one of the components of velocity of the molecules. The equipartition of the molecules was thus disturbed and this component proceeded to borrow energy from the other velocity components and from the rotational energy of the molecules, with the result that equipartition was restored, but at a lower temperature. A refrigerator working on this principle simply operated on a reversed Carnot cycle, giving up heat to circulating water on compression at the high temperature, and then extracting it at the low pressure and temperature from what, in an ordinary engine, would be called the condenser. It was remarkable that this obvious design took so long to achieve, but lubrication was difficult.

With the help of various types of machine based on these principles, hydrogen and helium could be liquefied and solidified, and temperatures down to a little below 1 deg. K. could be reached. At about 0.8 deg. K, the process failed, and surprising things had been discovered in this range of temperatures, such as superconductivity in certain metals and compounds, with associated extraordinary magnetic properties; also that queerest of all substances, liquid helium, could go to the lowest temperatures without solidifying except under high pressure, while at the lower pressures it refused to stay in a cup but crept over the edge on to the floor.

It was the greatly enhanced magnetic properties of many substances at very low temperatures which had made possible the next stage in refrigeration, and Dr. Darwin then explained how paramagnetic susceptibility was very much affected by temperature. He regarded each atom as containing a little freely suspended bar magnet exposed to a controllable external magnetic field but being also in the field of all the other little magnets. As the temperature dropped they all began to line up and cumulatively to exert forces on one another. Each little magnet could not be expected to know where the force on it came from, but would react to the total field acting on it. The result was important, and, until recently, very puzzling. Experiments failed to find any permanent magnetism at the predicted temperature, according to the Lorentz theory, but there was a faint and rather doubtful suggestion of it at a good deal lower temperature.

This subject was much more exciting than might appear at first sight, because a similar theory was applied for electricity as well as for magnetism, and there it had led to such fantastic results that for a long time no one was willing to face the problem at all. Until about four years ago the theoretical result was so contrary to the facts that anyone who realised the difficulty was frankly terrified of the whole problem. Happily, one now knew that Lorentz' theory was too simple, and an explanation had been found by various workers which showed that the co-operation between adjacent magnets, or di-poles, needed more thorough discussion than in Lorentz' theory. No one even now knew the full answer, but it was quite clear there was no reason to expect the onset of permanent magnetism at the critical temperature, and it was to be conjectured that it would not come at any point above the absolute zero.

Getting Below 0.003 deg. K.

If, said Dr. Darwin, it was so comparatively simple to get down to 0.003 deg. K. as had De Haas, of Leyden, and Simon, of Oxford, what stopped us there? The answer was that for each substance there was a sort of barrier preventing further chilling. When all the magnets were pointing the same way it would not be possible to get any further chilling anyhow, but some time before this point thermodynamics showed there must inevitably be a large increase in the specific heat extending over a certain range of temperature. This rise checked the temperature drop and made it very hard to get below it. The effect was really a convenience, because once the specimen had got into that range its temperature would stay nearly constant for some time in spite of the inevitable leakage of heat into it from the surroundings. To get much below 0.003 deg. K. it would be necessary to take a great bulk of inefficient material in a strong magnetic field and in a vacuum, and it simply could not be done technically. The method of demagnetisation by means of paramagnetism was exhausted at somewhere a little above a thousandth of a degree.

Although this was more or less how matters stood at present, it was not necessarily the end. Not long after the magnetic method had been shown to work, it was suggested that it would be possible to start a similar process for reaching a millionth of a degree by using the magnetism in the nucleus of the atom. A good many atoms had magnetic nuclei, and their strengths were about one-thousandth of those he had been discussing. Theory, however, suggested a curious difficulty. For the process to work, it was not sufficient merely to get the energy out of the magnets, but they must also be able to borrow energy from the rest of the system so as to restore equipartition, otherwise it could not be said that the temperature had been really lowered. Theory showed that the rate of this borrowing would depend enormously on the temperature. At 1 deg. it was instantaneous; at a thousandth it took seconds or minutes, but at a millionth it might easily take a million years. The heat insulation would, so to speak, become so good that different parts of the same molecule could be at different temperatures for a million years without the heat flowing from one to the other.

High-speed Electrons

However, the same work that revealed this difficulty showed a way out. The structure of a metal was very different from that of a salt, in that, however low the temperature, there were always electrons moving about in it at high speeds. They acted as "middle-men" and succeeded in bringing about equipartition quite rapidly. So it seemed likely that perhaps by the use of a metal in which the nuclei had a magnetic moment it might be possible to reach temperatures down to perhaps a hundred thousandth, or a millionth, of a degree.

The properties of matter at those low temperatures were not likely to be sensationally different, but Simon had suggested a more remarkable idea, which was that temperature itself would fade away.

For temperature to have a practical meaning it must be possible to measure it. This implied that the thermometer must be smaller than the body of which it was measuring the temperature, for otherwise it would itself disturb the body's heat. But there would be so little energy in the whole body that most of the time the thermometer would have none at all, and then occasionally would have too much. Actually, this region of indefiniteness was not at all far off. A grain of diamond dust which was just visible would have a quite indefinite temperature at the temperatures already reached.

Thus, concluded Dr. Darwin, we seemed to be ending on an anticlimax. Each successive stage in producing cold had called for greater efforts and had, on the whole, produced less results. In the first stage, one left all the rich variety of physical and chemical activity at ordinary temperatures—incidentally, the activity which made life possible—for the austere region of liquid helium in which all chemistry was lost and had only found as compensation the interesting phenomenon of diminished specific heats and the startling fact of superconductivity. In the second stage of paramagnetic demagnetisation there seemed even less novelty, and the chief interest was in whether things would become permanent magnets. In the third stage of nuclear demagnetisation one could not yet know what would happen, but the most likely thing was that the target being aimed at would simply fade away into indefiniteness.

Dr. W. M. Thornton, proposing a vote of thanks, said that a special point about these lectures, which were in the nature of refresher lectures, was that they brought one back to first principles. There were, in thermodynamics, regions where first principles were of the greatest importance. The high end was most important as regards turbines and machinery, and the low end was also extremely important—although the practical side had not been reached—in showing where matter began to lose its properties and became something with which one was not at all familiar. Mr. J. R. Beard seconded the vote of thanks.

During the meeting the President (Mr. Johnstone Wright) referred to the death of Mr. P. F. Rowell, the late secretary, and those present at the meeting stood in silence for a few seconds in his memory.

Aviation Radio Service

THE presentation of a reasonably comprehensive view of the several kinds of radio communication service upon with pre-war civil aviation was peculiarly dependent was aimed at in a paper by Mr. A. D. Hodgson (Air Ministry) which was submitted to the Wireless Section of the Institution of Electrical Engineers in London on May 1st.

The author described the system in this country and its immediate connections to the Continental and Empire networks, briefly indicating how European practice differed from American, with some reference to the Atlantic and Empire routes to the East and to meteorological information services. Communication requirements were stated and the growth of the service emphasised. For example, the number of machines dealt with at the Croydon airport alone had increased from 600 to 1,730 per month in six years. In one day there were 68 arrivals and 78 departures, while in one month 3,650 aircraft were communicated with by radio-telegraphy and 200 by telephony, weather messages numbered 2,200, true bearings 250 and magnetic reciprocals 350. Technical considerations included the requirements and layout of ground station equipment at both existing and many of the new stations which were being erected at the outbreak of war.

In discussing aircraft equipment and its installation the author explained that on small aircraft wind-driven generators were still used for both lighting and radio. On medium and large craft two generators of 1-kW each were driven by the aeroplane engines, delivering DC at 14 to 16 V for battery charging. While in flight all power could be obtained direct from the generators without draining the batteries, but it was not easy to provide a battery of ample capacity when it was also used for starting the aircraft engines.

It was worth considering whether a 50-V or even 100-V battery might not enable the weights of the radio motor-generator, cables and miscellaneous motors, starters, &c., to be reduced. The principal danger was that a short-circuit might cause arcing, but the author considered that a low-voltage battery of large capacity could also be very dangerous in that respect; adequate safeguards in either case should present little difficulty.

Advantages of A.C. Sets

Separate engine-driven generators delivering DC or AC, or both, would be practicable only in large aircraft for long-distance routes. Apart from continuity of supply in emergency, AC had much to recommend it purely from a radio point of view. At 800 cycles the weights of the necessary rectifier and smoothing circuits could be reduced to very economical limits and, at the same time, alternators were lighter than dynamos of equal powers.

The author suggested that the post-war rate of progress might possibly be greater than that of the immediate past. Perhaps one might look forward to types of aircraft planned to facilitate the application of radio communication and navigational aids. The use of moulded plastics might even enable craft to be built with an insulated section which would permit the fuselage to be used as a radiating system.

New developments were proceeding as follows:—(1) Equi-signal track beacons at frequencies of the order of 33-38 Mc/s, and even higher. (2) Improvements in blind-approach and landing systems, including a true glide path. (3) Development of an absolute altimeter. (4) High-frequency direction-finding. (5) Devices for providing warning of collision. (6) Homing devices at frequencies of the order of 33-38 Mc/s. (7) Direction-finding (free from polarisation errors) for use on aircraft. (8) The coupling of a blind-approach and landing system with an automatic pilot equipment. (9) The coupling of homing devices with automatic pilot was now an accomplished fact, but so far as the author was aware the system had not been used on passenger transport aircraft.

Considerable work had been carried out in the U.S.A. and in Germany on the use of very high frequencies for equi-signal beacons. Tests had also been made in Australia, where a 33-Mc/s track beacon was in use. The aerial system comprised two synchronously switched reflectors and one radiator after the manner of the landing and approach system, erected on a tower 30 metres high. An aerial power of ¼ kW produced ranges of 160 km. at 2,000 to 3,000 metres although the receivers had a sensitivity of the order of 300 μV/m.

Experiments in the U.S.A. on frequencies in the 60-66 Mc/s band had been very successful, and both vertically and horizontally polarised four-course equi-signal track beacons had been tried. As a result it was anticipated that in due course most of the existing medium-frequency beacons would be replaced by these VHF beacons. The advantages were freedom from static, freedom from reflection from the ionosphere, more economical aerial system, and less space required; also the possibility of placing a larger number of stations in a given frequency band.

Numerous forms of blind-landing systems were being developed. The principles were in general similar, but as the requirements of the glide path were not easily combined with those of the horizontal guidance the best system might ultimately be one employing a separate glide-path transmitter. Horizontal guidance plus an absolute altimeter might provide a better solution than the radiation of a glide path.

A very promising development was horn radiators employing the principles of radiation from hollow conductors. The highly directional and easily controllable radiation patterns produced had much to recommend them for use in blind-landing systems, and also for localising beacons for warnings, landmarks, &c.

Correspondence

Resistance of Tungsten Filaments

IN the interesting article by Mr. G. T. Garwood on "Tests on Wood Poles" in your issue of April 12th there appears to be an error on page 424, where the resistance of two 25-W 230-V vacuum lamps is quoted as 4,120 ohms when cold and 4,318 ohms at rated voltage.

The characteristics of tungsten filaments are such that the cold resistance is very much lower than the resistance at the normal operating temperature and is of the order of 170 ohms for a single 230-V 25-W lamp, so that the resistance of two of them in series would be some 340 ohms when cold and not 4,120 as quoted.

Presumably, the error is due to the fact that the characteristic of tungsten filaments is very steep and that the reading of 4,120 ohms was obtained when the filament was at a substantial temperature and not "cold."

London, W.C., *April 24th.* A. G. PENNY.

With regard to the above, Mr. Garwood writes us as follows:—"The resistance of 4,120 ohms was clearly taken with appreciable current flowing through the lamps, though as I was not personally responsible for the resistance test, I am unable to give details at this stage. It will be appreciated, however, that this point does not influence the relevant conclusions in my article, as the lamp-resistor was clearly developing its nominal resistance of 4,000 ohms at the critical stages of the experiments."

Electricity and Magnetism

Professor Kapp's article in your issue of April 26th is timely. So much work must be done by a student of electricity that there is no time to waste on non-essentials. In this connection may one mention Dr Drysdale's admirable book "The Foundations of Alternate Current Theory." This was published thirty years ago at a reasonable price, but it has not come into use as it ought to have, although electrical men who have read it have declared that it is the very book which they needed. It bases electrical theory on mechanical analogy on Clerk Maxwell's method; the meaning of resistance, inductance, capacitance, power factor and how a transformer works is shown by mechanical models, which bring life into what otherwise look like dead formulæ. Formulæ are derived mechanically and converted into electrical shape, and students obtain a perfectly clear idea of what everything means. The mechanical model of a transformer with weights and a differential gear is most ingenious and helpful. The book introduces vector calculation and puts the students in a position to use higher mathematics with understanding.

Dr. Drysdale contemplated a second volume dealing with more advanced work and one can only hope that this may yet appear. C. TURNBULL, M.I.E.E.

Tynemouth, *April 27th.*

I.E.E. Annual Report and Accounts

COPIES of the annual report of the Council of the I.E.E. for the 1939-40 Session and of the accounts for the year ended December 31st, 1939, can now be obtained by members of the Institution on application to the secretary.

PERSONAL AND SOCIAL

Information regarding new appointments and other matters of interest for this page are welcomed

BRIGHTON Transport Committee recommends that **Mr. Arthur Brown**, A.M.I.E.E., at present chief assistant electrical engineer in the Transport Department, shall be appointed deputy transport manager as from May 1st.

In our last issue we briefly announced the appointment of **Mr. R. C. Miller**, A.M.I.E.E., as electrical engineer of the Docks and Marine Department of the Southern Railway Co., Southampton, in succession to the late Mr. H. Wauchope, and the appointment of **Mr. E. S. Ely**, A.M.I.E.E., as assistant electrical engineer.

Mr. Miller was educated at the Linewell College of the Christian Brothers at Gibraltar and received practical training in the Military Communications Section.

Mr. R. C. Miller

Mr. E. S. Ely

On returning to this country he completed a three years' course at Hartley University College, where he gained his diploma. For two years he was with Mawdsleys, Ltd., of Dursley, Glos, after which he took charge of a large electrical installation which that company had supplied to the Unity rubber factory at Manchester.

He joined the L. & S.W.R. Co. in 1911 as junior electrical assistant on the staff of Mr. Wauchope in Southampton Docks, and was closely associated with him in 1924 in the conversion of all dockland pumping stations from steam to electric drive and subsequently with the electrical work in connection with the King George V Graving Dock and the supply of electrical power to the whole of the new dock estate. Mr. Miller is vice-chairman of the Southampton University College Joint Committee.

Mr. Ely received his education at Taunton's School and Hartley University College, Southampton, and in 1912 was apprenticed as an electrical engineer with the L. & S.W.R. Co. in the docks. He served in the last war and being invalided out of the Service in 1919, he spent four years of convalescence in technical study, taking a full course in electrical engineering.

In 1922, restored to health, he became assistant in the test department of Allen West & Co., and two years later he joined the English Electric Co. at Stafford as a draughtsman. He returned to the Southern Railway Co. in 1928 and has since occupied the position of chief draughtsman and technical assistant. He has been closely associated with Mr. Miller in connection with the docks extension and the King George V Graving Dock. Mr. Ely is a member of the Committee of the Hampshire Sub-Centre of the I.E.E. and is also an associate of the American I.E.E.

Halifax Light, Heat and Power Committee has recommended the appointment of **Mr. T. M. Blackburn** as deputy electrical engineer and manager. Mr. Blackburn held the position of acting engineer and manager for a considerable period until the recent appointment of Mr. A. G. Connell, and the Committee has expressed its appreciation of the admirable manner in which he carried out those duties.

Before giving the thirty-first Kelvin lecture at the Institution of Electrical Engineers in London on Thursday, April 25th, **Dr. C. G. Darwin, F.R.S.**, referred to a matter which, he said, while of more interest to himself than anyone else, was a remarkable coincidence. When he was baptised his parents invited Sir William Thomson (afterward Lord Kelvin), who was a friend and patron, scientifically, of his father in his work on the tides, to be a godfather. The other scientist asked to act as godfather was a cousin, Francis Galton, one of the founders of modern statistics and the man who established the principles of eugenics. Dr. Darwin added: "Last year I delivered the Galton Lecture and this year I am delivering the Kelvin Lecture."

Before presenting the Faraday Medal to **Dr. Alexander Russell, F.R.S.**, at the meeting of the I.E.E. on April 25th, the President (Mr. Johnstone Wright) said that Dr. Russell, who was a Past-President and Honorary Member of the Institution, had been awarded the Medal under two heads, viz., scientific achievement and conspicuous services rendered to the advancement of electrical science. Under the first heading his work for some considerable time had been recognised as authoritative in the fields of AC phenomena, inductances and electrostatics. His investigations into the distribution of electricity on adjacent spheres were probably the most complete research into the theory of the sphere gap, which was now universally used as the standard of high potential differences in electrical testing. Perhaps, however, his greatest achievement came under the second heading. Dr. Alexander Russell and Faraday House were synonymous. Old Faradians were to be found in practically every part of the world, and all of them owed much to the great inspiration of Dr. Russell's teaching and fatherly guidance. On behalf of the Institution he wished Dr. Russell good health and happiness in his retirement.

For their devotion to duty two employees of the Finchley Corporation Electricity Department, **Messrs. H. Sear** and **W. J. Neal**, have been commended and awarded honoraria of five and two guineas respectively. In the interests of other workmen's safety they worked hard for more than twenty minutes to dispose of nitric acid when a glass tank cracked allowing the liquid to make contact with a galvanised iron tank, so releasing a highly irritant and noxious gas. Although the fumes were heavy and breathing difficult, they succeeded in dispersing the acid and fumes. Both suffered considerably from the effects of the gas.

Mr. G. W. Clarkson, chief assistant engineer in the Worcester Corporation Electricity Department, has been recommended by the Electricity Committee for the appointment of city electrical engineer in succession to Mr. C. M. Shaw.

The annual dinner of the Worcester Electricity Works Recreation and Social Club was held recently at the Works Institute. **Mr. C. M. Shaw,** city electrical engineer, who was presiding for the last time before his pending retirement, in proposing the toast of "The Mayor and Corporation," said that after thirty-five years' service in Worcester it would naturally be a very big break to him to finish his official work. He had many pleasant recollections of his early life in Worcester. Dr. W. E. Moore Ede (the Mayor), in responding, paid tribute to the services rendered to the Corporation by Mr. Shaw, who, he said, had made a great position for himself among his electrical colleagues all over the country.

Mr. B. Croft Bayley, M.B.E., M.I.E.E., chief electrical engineer of John Player & Sons, Nottingham (branch of the Imperial Tobacco Co., Ltd.), has been nominated for the chairmanship of the East Midland Sub-Centre of the Institution of Electrical Engineers for the 1940-41 session.

Sir Alexander Gibb, G.B.E., presided at the annual dinner of the Institution of Engineers-in-Charge at the Holborn Restaurant on April 19th. The toast of the Institution was proposed by Sir Clement Hindley, and that of "The United Services" by Sir Leopold H. Savile, K.C.B., the response being made by Engineer Vice-Admiral Sir George Preece, K.C.B., Engineer-in-Chief of the Fleet.

Sir James Scott Pitkeathly has retired from the position of Deputy Director-General of Supply in India. Born in 1882, he was a graduate of Edinburgh University, and first went to India in 1904 as an electrical engineer in the employ of an Edinburgh firm. His first job in India was the electrification of collieries at Singerani, and he returned again to construct the first hydro-electric plant at Mussoorie Hills. In 1919 he accepted the post of Electrical Inspector of the United Provinces. During the last war he was Director of Electrical and Mechanical Works in Mesopotamia. His most important work, however, began in 1922 with the formation of the Indian Stores Department, of which he was made Chief Controller. He was knighted in 1933. With the outbreak of the present war he became associated with the Department of Supply.

Mr. F. L. Hallard, 16, Scarisbrick Road, Levenshulme, Manchester, 19 (Rusholme 1356), has joined the lamp sales staff of E. K. Cole, Ltd. He first entered the electrical industry in 1914, when he joined the General Electric Co., Ltd., and of recent years he has been representing Thorn Electrical Industries, Ltd., for Atlas lamps. He is well known throughout the territory he will be covering for E. K. Cole, Ltd., which includes Lancashire and North Wales.

Mr. F. L. Hallard

Mr. G. E. J. Day, mains superintendent in the Hammersmith Borough Council Electricity Department, is retiring to-day (Friday) and the Council has placed on record its appreciation of his service to the undertaking, with which he has been associated for forty years.

Mr. O. D. Williams, A.M.I.E.E., M.A.Min.E.E., of the Electricity Department of First Garden City, Ltd., Letchworth, has resigned his position as shift charge engineer to take up an appointment with the British Thomson-Houston Co., Ltd., at Rugby.

Mr. A. T. Hobbs, M.Inst.C.E., has resigned his appointment as secretary of the Diesel Engine Users' Association.

The services of **Mr. T. W. Graves,** A.M.I.E.E., a senior assistant in the chief engineer's department of the L.C.C., who is due to retire on May 23rd, are being retained until November 30th.

Mr. A. Clark, A.M.I.E.E., chief power engineer, British Celanese, Ltd., and **Mr. H. E. Midgley,** M.A., M.Inst.C.E., M.I.Mech.E., chairman of the Brush Electrical Engineering Co., will represent large consumers on the East Midlands Electricity Advisory Board.

Mr. M. C. Toner, who has been publicity manager of Holophane, Ltd., for seven years, vacated that position on May 1st. He joined the Holophane Co. seventeen years ago from Sir W. G. Armstrong-Whitworth & Co., Ltd., for whom he was for three years in the West of England as sales engineer representative for country house lighting plants and stationary engines. He has been sales representative in the London, South London, Southern Counties, Eastern Counties, and finally in the North-Eastern area, with his centre at Leeds.

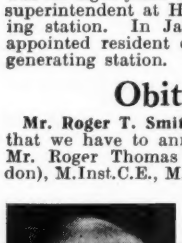
Mr. Toner has been a member of the Illuminating Engineering Society for fifteen years, and has been responsible for many commercial and industrial lighting schemes.

Mr. H. Branton has been appointed assistant electrical engineer (Neasden)

in succession to the late Mr. S. W. Corns, and has been made an officer of the L.P.T.B. Mr. Branton joined the Metropolitan Railway Co. in March, 1930, as assistant resident engineer at Neasden generating station. For twelve years he had been with the Northampton Electric Light & Power Co., where he began as charge engineer, and afterwards was for eight years assistant to the works superintendent at Hardingstone generating station. In January, 1933, he was appointed resident engineer at Neasden generating station.

Obituary

Mr. Roger T. Smith.—It is with regret that we have to announce the death of Mr. Roger Thomas Smith, B.Sc. (London), M.Inst.C.E., M.I.Mech.E., M.I.E.E., M.Inst.T., the well-known consulting engineer, and a past-president of the Institution of Electrical Engineers. Born in 1863 at Forest Hill, London, Mr. Smith was educated at Mill Hill School and University College, London, and served a pupilage at the works of Hathorn Davey & Co., Leeds. In 1890 he went to India as engineer and representative for Easton, Anderson & Goolden, where he was engaged on the erection and maintenance of water and sewage works pumping machinery. On returning to this country in 1894 he became a resident engineer at Davies Street generating station, London, and in the following year was appointed technical manager of the Cie Hydro-Electrique Anversoise, supplying electricity to Antwerp. In 1898 he became assistant in the consulting firm of Sir Alex. Kennedy & Jenkin and seven years later was appointed electrical engineer to the Great Western Railway. Since 1924 he had been a partner in the consulting engineering firm of Highfield & Roger Smith. For three years he was a consulting engineer to Construction Electriques de France, and he reported with Sir Felix Pole on the Sudan Government Railways and Steamers. Mr. Smith was a member of the Société des Ingenieurs Civils de France, and was an engineering member of the Senate of the University of London. It was only in February last that the Council of the I.E.E. elected him an honorary member of the Institution. The funeral service was held yesterday (Thursday) at St Mary's, Bryanston Square.



The late Mr. Roger T. Smith

The death is announced of **Mr. Robert Yuille**, of Robert Yuille & Sons, Ltd., installation contractors, of Kilmarnock. The firm was founded in 1853 by his grandfather, and Mr. Robert Yuille had been associated with it throughout his life, becoming eventually a partner, and on its conversion into a private limited company, a director.

Mr. Isaac B. Lucas, former Attorney-General of Ontario, died at his home in Toronto on March 8th at the age of seventy-three. For twenty years he was connected with the Ontario Hydro-Electric Power Commission and was general solicitor and counsel for the Commission for seven years, retiring in 1934.

Mr. H. J. Widgery.—The death occurred on April 24th of Mr. H. J. Widgery, who had represented J. H. Tucker & Co., Ltd., in the North London area since 1924.

Mr. T. F. Holden.—The death occurred on April 22nd of Mr. Thomas Fletcher Holden, of Holden & Hunt, electric resistance welders, Old Hill, Staffs, at the age of fifty-eight. It was in 1919 that Mr. Holden, in conjunction with his lifelong friend Mr. H. G. Hunt, inaugurated the firm of Holden & Hunt at premises in Clifton Street, Old Hill. Both were practical men in the science of resistance welding. With the growth of the business it was transferred in March, 1924, to a site at Cox's Lane, where the present works were built and have continued to expand ever since.

Mr. J. A. Foster.—The death is announced of Mr. J. Arnold Foster, of Sidcup, which occurred on April 22nd. Mr. Foster, who was an electrical engineer, was a contemporary of Kelvin and Lister, and had lived in retirement for several years.

W. H. Scott Memorial.—A memorial to the late Mr. W. H. Scott, founder of Laurence, Scott & Electromotors, Ltd., was unveiled at the Gothic Works, Norwich, on April 27th. The memorial, which was presented by the employees and staff of the various works and branches, is in the form of a bronze plaque showing the head and shoulders of Mr. Scott in a characteristically thoughtful mood. It is the work of Mr. Charles Hartwell, R.A., who is exhibiting the original plaster at the Royal Academy this year. The plaque has been mounted on a wall of the building near the 1914-18 War Memorial.

The ceremony was attended by a number of personal friends of the late Mr. Scott and by employees, staff and many pensioners. Mr. Cozens-Hardy, for many years a director of the company, spoke of the early days of the firm when Mr. Scott, with a few workpeople, was laying the foundations of the company. Sir Wm. Reavell referred to his long personal association with Mr. Scott, and the Lord Mayor of Norwich (Alderman J. F. Henderson) paid tribute to the happy relations that had always existed between the company and its employees, who now number well over two thousand in Norwich alone. Other speakers included Mr. G. J. Scott, chairman of the company, and Mr. G. H. Wilson director and secretary.

Electrical Export Groups

Sir Clive Baillieu's Address

FURTHER information regarding export groups, particularly in relation to the electrical industry, was given by Sir Clive Baillieu, executive member of the Export Council, in an address on April 24th at the Victoria Hotel, London, W.C.2. The present situation, he said, had caused the Government to frame a policy designed to narrow the growing gap between merchandise imports and exports by a closer control of imports, by various measures intended to contract consumption both by direct taxation and other means, and by the mobilisation by the Treasury of foreign securities. Finally, there was the task of increasing exports.

In a preliminary survey of the situation, the Executive Committee came to the conclusion that in the world markets as a whole there existed a very considerable measure of goodwill for British products—goodwill which certainly had not lessened since the outbreak of war and which might have been increased. On the other hand, the task of the exporter was being hampered by the increasing difficulties of quoting firm prices and deliveries. Into this problem many factors entered, but the fundamental difficulty was one of raw materials. The conclusion was reached, therefore, that unless there was an assured and expanding basis of raw materials export trade could not be maintained, much less extended.

In the first few months of the war there were many inevitable dislocations, and the Services were bound to receive a certain preference in the supply of materials. Now, however, the Committee was determined to achieve a better balance between the Services and the home market and export. The Committee had to know what raw materials were available, and had to be satisfied that if these could be secured they would be equitably divided, and that the proceeds of the exports would flow back into the sterling system. The central feature of the scheme adopted was group organisation. Once it was formed the first duty of a group was to assess its raw material needs; this done, it was incumbent upon the industry, either directly or in association with the Industrial Supplies Department of the Board of Trade, to decide upon the most equitable method of distribution.

Other problems to which group action could be directed included markets, credit and labour, and one of the first things a group might do after surveying its raw material needs was to look to its plant capacity and determine the proportions to be directed to the satisfaction of export, home and Service needs. With regard to the question as to whether the Committee could suggest suitable markets, that seemed a very hazardous thing to do to-day. To frame a priority list might create complications in the Foreign Office and elsewhere. As they were in touch with the various Government Departments, they were able, however, to canalise their views and give advice on problems put to them.

There were two main directions in which industry could powerfully contribute. If manufacturers could aim at a closer estimation of requirements, at keeping inventories under review, at a proper statement of specifications, and at considering from time to time whether it was possible to use cheaper or more readily available substitutes, and, above all, if they could watch the timing of their needs so as to ensure the minimum diversion of plant capacity and raw materials from export requirements, they would be doing a great deal to help the export drive. Great businesses might tend to build up reserves of material or completed units. In so doing they were immobilising materials essential for the export drive. By inculcating a better sense of timing they might acquire an added volume of material available.

The other main contribution that they could make was by ensuring that the commercial arrangements as a whole were adequate and that all their resources were directed to the furtherance of exports. Traditional habits and practices must be revised, and industry was asked to consider how resources could be pooled for the benefit of the export drive, how information could be properly exchanged, how a more stable level of prices overseas could best be secured, and how a harmoniously operating and sanely conducted home market could be maintained. A large part of the materials used by the British export industry was brought to this country in our ships and everything exported left in them. Industry, therefore, ought to accept an implied trust to make the best use of materials given to it for export.

In conclusion, Sir Clive asked manufacturers to co-operate on voluntary and agreed lines to ensure that the best came from the scheme. They were, after all, engaged in what amounted to total war. In Germany the electrical industry had for years been under complete control of the State. The drive was based on the good sense and capacity for co-operation and co-ordination which existed in the average Britisher, especially when the safety of his home was challenged.

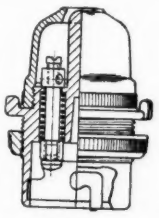
Answering various questions put to him, Sir Clive said that it would be dangerous to make a declaration in principle regarding the maintenance or rupture of existing international trade agreements, and asked for details of individual problems. Although there was little chance of the Board of Trade resuming publication of its detailed statistics, he gave an assurance that when problems affecting group action were concerned, in which everything must be based on an examination of the relevant statistical data, the group representatives would have proper access to the records. The Export Council would deal only with groups, and if after a given time any firm chose to stand out, the Council would regard it as a declaration that that firm was not interested in export.

NEW ELECTRICAL PRODUCTS

A Review of Equipment Recently Marketed

Cordgrip Lampholder

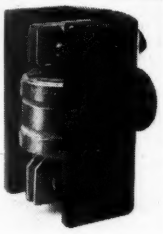
THE principal feature of a cordgrip lampholder introduced by the GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, London, W.C.2, is that it makes it unnecessary to hold the cap of the lampholder when unscrewing the shade ring. Two projections extend vertically from the flange outside the cap, and diametrically opposite each other. The flange and projections are moulded integral with the body of holder, and the projections provide a reliable grip. They can be held by one hand while the shade ring is removed by the other, and there is no tendency for the cap to be unscrewed during the operation. This advantage in use has previously belonged only to the more expensive non-rotating cap type of lampholder. The projections do not substantially increase the overall diameter.



Sectional diagram of G.E.C. lampholder

Shrouded Fuse Carriers

As an alternative to their standard fuse carriers for dwarf and short type unit pillars, BRITISH INSULATED CABLES, LTD., Prescot, Lancs, are now supplying hand-operated shrouded fuse carriers of moulded bakelite to take English Electric "J" type h.r.c. fuses.



B.I. shrouded fuse carrier

The fuse contacts are fitted with the company's standard wedge-tightening device and have insulated adjusting screws with thumb grips, thus obviating the necessity for a separate key. When the carrier is in position all live metal parts of the fuse and contacts are efficiently shrouded. The carriers are available in 150-, 300- and 500-A sizes and are interchangeable with the key operated carriers in existing pillars and units of the types mentioned. They comply with Home Office Regulations, where these apply.

The units are particularly suitable for sub-station panels and they can also be used for fixing on switchboards or flat panels. For this purpose contacts are provided for either back or front connection.

Table Griller

The table griller introduced by VITAGRILL, LTD., 146, Bishopsgate, London, E.C.2, can be used not only for grilling on the table but also for boiling kettles and warming plates (after being switched off) and as a portable radiator. Due to its construction, which incorporates a ceramic centre, there is no smoke or odour while grilling.

Vitagrill table griller

Both standard and *de luxe* models are available, the former being finished in highly polished aluminium and the latter in attractive colourings of red, blue, green or gold. Both models are supplied complete with aluminium dish, grilling grid, connector, 9ft. of flex, and a combined 2-pin plug and lampholder adaptor. The loading is approximately 400 W.

Domestic Lighting Fittings

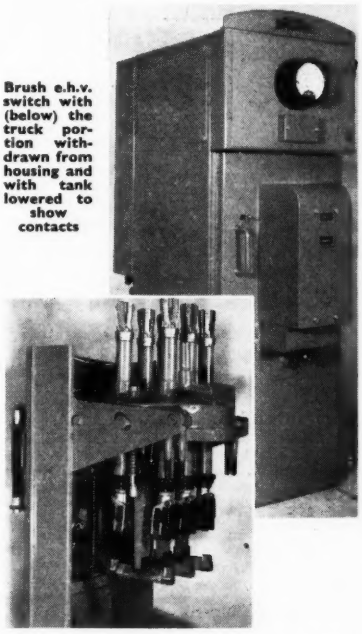
Several new domestic lighting fittings are announced by BERRY'S ELECTRIC, LTD., 85-86, Newman Street, London, W.1. Wrought-iron picked out in ivory, pink and green, is employed effectively as a decoration for two ceiling fittings. One, the B.E.4062, is a triangular flush unit with cream metal framework and peach-flashed opal glass; it is available in two sizes, taking two or three lamps. Another ceiling fitting, the B.E.4065, which is also available as a pendant, incorporates a circular dish of peach, champagne or white-flashed opal glass and takes two lamps.

Berry B.E. 4061 and (left) B.E. 4062 lighting fittings

The B.E.4061 ceiling fitting has a plate-glass top surmounting a glass dish of white, green, amber or peach; this fitting takes two lamps. Of somewhat more unconventional design, the small semi-flush B.E.4067 unit has a conical metal top on which is suspended a "Cyrophane" glass dish of beige, peach or green, a decorative metal base adding a finishing touch.

Switchgear Developments

Extra-high-voltage switchgear recently developed by the BRUSH ELECTRICAL ENGINEERING CO., LTD., Loughborough,



Brush e.h.v. switch with (below) the truck portion withdrawn from housing and with tank lowered to show contacts

includes metal-clad vertical isolation switch units with air-insulated busbars for service up to 11 kV, 150 MVA rupturing capacity. A typical unit with spring closing mechanism for the oil circuit-breaker is illustrated, together with the truck portion withdrawn from the housing and with tank lowered to show contact components. The units are designed for speedy vertical isolation and incorporate many features which must appeal to those charged with the duty of maintaining switchgear. The contact system of the high-voltage oil circuit-breakers is a case in point where expense has not been spared to facilitate contact inspection and renewal.

The component parts of these units, such as the oil circuit-breakers, isolating devices, cable boxes, &c., are all made at the Brush works, and in addition to the e.h.v. breakers, a range of switchboard and cubicle type medium-voltage oil breakers is in production. For operating these circuit-breakers, hand-operating mechanisms are available in the usual form and spring-closing and solenoid operating mechanisms are in production for the e.h.v. series.

The company is producing a considerable amount of industrial switchgear with drawout and non-drawout oil circuit-breakers up to 30 MVA rupturing capacity, this gear being frequently arranged in double- or three-tier formation to save space. A separate section of the works has recently been set up for the manufacture and complete testing of instrument transformers.

Arc Welding Electrodes

New "Faceweld" arc welding electrodes announced by the LINCOLN ELECTRIC CO., LTD., Welwyn Garden City, Herts, are intended for hard-facing by the metallic arc process. They are cast abrasion-resisting alloys and bond well with all types of ferrous alloys.

Two types are available. No. 1, a general-purpose hard-facing electrode, is used for surfacing such parts as digger teeth, scarifiers, grader blades, cement works machinery, coke-handling machinery, clay, brick and tile machinery, etc., by arc welding. No. 12, which is somewhat harder than No. 1 and has superior resistance to abrasion, is suitable for screw conveyors, conveyor sleeves, ploughs, gyratory crushers, power shovel and dragline bucket parts, dredge pump impellors and casings, coal pulveriser jaws, cement mill machinery, &c.

Industrial Reflector

A new "Mazdalux" industrial reflector for use with a 400-W "Mercra" lamp has been developed by the BRITISH THOMSON-HOUSTON CO., LTD., Crown House, Aldwych, London, W.C.2, as an addition to its low-temperature range for situations where it is desired to incorporate the choke in the reflector and thus simplify installation.

"Mazdalux" dispersive reflector with built-in choke

The weight of the fitting is supported by a casting and lugs on the body steady the equipment and reduce the load on the conduit. Easy access to the choke terminals is achieved by removing three screws and lifting the top cap. The reflector, which is of the over-lamp type providing easy maintenance, is spun from heavy gauge steel, all joints being welded to ensure continuous enamelled surfaces. The vitreous enamel finish is white inside and green outside. No screws, clips or other loose parts are used in the construction and the reflector cannot be knocked off.

COMMERCIAL and INDUSTRIAL NEWS

Lighting Service at Leeds. E.A.W. Activities. Action Against C.E.B. Fails

Cable Export Group

The electric cable and insulated wire industry has received the approval of the Export Council to an Insulated Conductors Export Group which it has formed. The chairman of the Executive Committee is Mr. T. H. Martin Harvey, of British Insulated Cables, Ltd. The secretary is Mr. K. J. McKillop, High Holborn House, 52-54, High Holborn, W.C.1, and manufacturers and exporters of cables and insulated wire are asked to get into touch with him for further details.

Leeds Lighting Service Department

The Leeds Corporation Electricity Department has recently completed a lighting demonstration room containing examples of the principles of good lighting and the latest types of commercial and industrial fittings and lamps, and facilities have been provided for short descriptive lectures on any phase of lighting. A general invitation has been issued to all local societies and associations to take advantage of these arrangements. The local electrical traders have also been invited to bring their clients and to make general use of the demonstration room.

Features of the room include industrial diffusing units which form the main lighting. The new 80-W fluorescent lamp is a prominent exhibit, while showcase lamps, &c., group, the number out of work being 7,641 or 4.1 per cent., showing a fall of 0.5 per cent., as compared with February, and of 3 per cent., as compared with March, 1939.

The new lighting demonstration room of Leeds Corporation Electricity Department

lighting and a range of discharge lamps are also shown. The bad effects of inefficient lighting, and the remedy, are demonstrated, while other features are simple displays made effective by fluorescent lighting, a range of architectural lamps, and photographs of various lighting installations. The E.L.M.A. Lighting Service Bureau has been taken as a guide in the layout and construction of the demonstration room, and the advice and assistance of its district engineer has materially helped in its success.

Employment in March

In the engineering industry as a whole the numbers recorded as unemployed showed a decrease in March, and there was an improvement in employment in the electrical section of the industry. According to the *Ministry of Labour Gazette* the percentage of unemployed in the engineering industry as a whole at March 11th was 2.7, as compared with 3.3 at February 12th and 7.4 at March 13th, 1939. In electrical engineering, the number out of work was 2,463 or 2 per cent., as compared with 2.4 per cent. in February and 5.1 per cent. in March, 1939.

The unemployed in the electrical wiring and contracting industry totalled 2,828, the percentage being 6.6, as against 8.4 in February and 10.8 in March, 1939. There was also an improvement in the electric cable, apparatus,

Sulphuric Acid Control

The Minister of Supply has made the Control of Sulphuric Acid (No. 2) Order which revokes the No. 1 Order. It does not materially alter the system of control applicable to the industry, but it clarifies the earlier Order in the light of experience gained. A Direction is also issued raising the maximum prices which may be charged. As from May 1st the addition which may be made to the basic price in the case of 77 per cent. acid is 15s. 6d. per ton and *pro rata* for acid of other strengths.

E.I.B.A. Annual Meeting

The Electrical Industries Benevolent Association is holding its annual general meeting at noon on May 17th, at its headquarters, 6, Southampton Place, London, W.C.1, and all members will be welcome.

Electrical Wholesalers' Federation

Owing to the existing conditions the annual dinner of the Electrical Wholesalers' Federation will not be held this year. The annual meeting was held on April 18th at the Connaught Rooms, London, W.C.2, and was well attended despite the difficulties of travel.

Trolley-bus Orders

Among orders for electrical equipment for trolley-buses received by the General Electric Co., Ltd., during recent months, are equipments for Cardiff, Edmonton (Canada), and Hobart (Tasmania). The ten equipments in hand for Cardiff are particularly interesting as they represent the first stage in the change-over from trams to trolley-buses in that city. Both the export orders are repeats, the Canadian contract covering three equipments similar to those supplied towards the end of last year, and the Tasmanian order being actually the fifth occasion on which G.E.C. electrical equipment has been specified for trolley-buses for Hobart.

Sewage Disposal Plant

On account of the expanding industries and increasing population in the area, the Luton Corporation is now building a new sewage disposal works which will include the most modern plant and processes. For the disposal of the sludge it was decided to adopt the Porteous process, in which the sludge is treated at high temperature and pressure. After this treatment it can be readily dewatered in a filter press. The resultant material has a high calorific value—about 9,000 BThU in a completely dry state—and is used as boiler fuel.

The fuel is fed to the mechanical stokers of tri-drum water-tube boilers manufactured by International Combustion, Ltd., steam being generated at 180 lb. per sq. in. and superheated to 550 deg. F. The boilers are fitted with special air heaters feeding hot air to the furnaces which help to dry the press cake immediately before combustion. In the engine room are three Browett-Lindley engines coupled to B.T.H. 100-kW alternators running at 600 RPM and generating at 400 V, three-phase, 50 cycles. The main switchboard in this engine room is of B.T.H. manufacture and comprises three alternator panels, a thyratron voltage regulator panel, a blank panel, and three power and lighting panels.

All the plant in the engine room is being supplied by W. K. Porteous, Ltd., and includes four large low-pressure air compressors manufactured by Activated Sludge, Ltd., each driven by a B.T.H. 50/15.8 HP variable speed AC commutator motor with hand-operated brushgear for regulating the speed between 1,425 and 450 RPM. The main sludge pumps are driven by two B.T.H. 20/10 HP variable speed AC commutator motors with a speed range of 1,400-700 RPM. Induced draught and forced draught fans, stokers, pumps, conveyors, cake breakers and other machinery are all driven by B.T.H. squirrel-cage induction motors with direct-on starters.

Action Against Central Board

In the King's Bench Division last week, Mr. Justice Hallett reserved judgment in an action brought by the Artisans' & General Dwellings Co., Ltd., against the Central Electricity Board for a mandatory injunction to compel the Board to remove electric lines, &c., from land belonging to the plaintiffs at Watford and Pinner.

The plaintiffs stated that the works were carried out under two consents by the Minister of Transport, but they claimed that the consents were subject to the right of the plaintiffs to give twelve calendar months' notice for the removal of the works. In December, 1935, the plaintiffs gave notice of the termination of their consent to the works, to take effect upon December 31st, 1936, but the period was extended by the plaintiffs to March 31st, 1938, when they declined to give further consent. The defendants, however, refused to remove the lines, and in July, 1938, they applied to the Minister of Transport for his consent to the lines and works being retained in position. The Minister deferred taking action pending the judgment of the Court in the present case.

The defendants denied that the notice of December, 1935, was effective, and said that the works were lawfully retained in position. They had made, and plaintiffs had accepted, payment in respect of the works up to December, 1938. On December 6th, 1938, the Ministry had held an inquiry, but the plaintiffs objected that the Minister had no jurisdiction to consider the Board's application, and the inquiry was subsequently adjourned pending the result of this action. The plaintiffs also claimed damages for alleged trespass in addition to the injunction.

On Tuesday last Mr. Justice Hallett delivered his considered judgment, in the course of which he said he would have to consider two ill-conceived documents for which the Board was responsible and two ill-drafted Sections of Acts of Parliament, viz., Section 22 of the Electricity (Supply) Act, 1919, and Section 11 of the Electricity (Supply) Act, 1922, and furthermore a course of conduct by the Board which, however well intentioned, as no doubt it was, seemed to him to have produced a great deal of unnecessary trouble and expense.

The plaintiffs called in question the Board's rights to carry a line of pylons and wires across their land. Before the 1919 Act the right to place pylons and wires on private land was acquired only by agreement with the owners of the land, but Section 22 of that Act gave

the authorised undertakers that right upon getting the consent of the Minister of Transport thus over-riding the need of coming to an agreement with the owners. The Section included a proviso to the effect that before placing any such lines across any land the undertaker should serve on the owner and occupier notice of its intention. But if within 21 days the owner and occupier failed to give the consent then the consent of the Minister must be obtained. The form of that consent raised one difficulty because there was little doubt that the Minister thought that one of the terms left to his discretion by the Section was to relate to pecuniary compensation for owners and occupiers.

His Lordship said he came to the conclusion that the notice given in December, 1935, was not effective. The Board did not become trespassers either upon the expiration of the notice or at any subsequent time. The claim for damages must therefore fail as well as the claim for a mandatory injunction.

His Lordship accordingly gave judgment for the Central Board with costs.

American Electrical Exports

Exports of electrical equipment from the United States during February were valued at $10,544,997, states the *Electrical World*, as compared with $10,585,091 in January and with $7,390,087 in February, 1939. Exports of stationary motors of from 1 to 200 HP advanced to $347,218 in February from $234,204 in January, while those over 200 HP decreased by 50 per cent., to $66,297 from $132,651. Foreign shipments of accessories and parts for motors increased from $168,955 to $317,755. The downward trend in electric household refrigerators exports was reversed in February when sales amounted to $681,259 as compared with $455,902 in January. Similar large increases were made by electrical indicating instruments which increased to $74,049 from $39,574; oil circuit-breakers and switches, exports of which advanced from $5,172 to $36,309; accessories and parts for generators, which totalled $209,085 as against $40,135 in January. Generators showed sharp decreases, exports of the AC type dropping to $20,529 from $289,129 and the DC type to $13,213 from $32,944.

Argentine Import Restrictions

The Argentine exchange authorities have now removed all restrictions on the importation of United Kingdom goods except that applications for permission to import certain articles are still subject to special examination. Such goods include electric motors and dynamos in general and spare parts.

Anglo-Swiss Trade Agreement

A war trade agreement between the United Kingdom and Switzerland was signed in Berne on April 25th. A similar agreement was also concluded between France and Switzerland. These agreements are concerned with various trade matters arising out of wartime conditions.

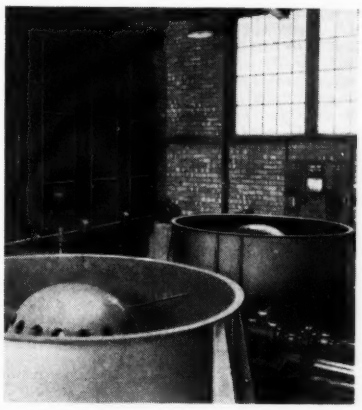
Trade Announcement

Hocking & Orchard, Ltd., 90, Victoria Street, Bristol, 1, have been appointed representatives for Crypton Equipment, Ltd., of North Acton Road, London, N.W.10. The territory comprises Cornwall, Devon, Somerset, Gloucester, Wiltshire and Dorset.

Dust-free Air for Rolling Mills

In steel rolling mills the condition of the surrounding atmosphere makes it essential that the air used for the ventilation and cooling of the electrical machinery should be carefully filtered. Plant installed at one of the South Durham Steel & Iron Co.'s mills has a total capacity of 120,000 cu. ft. per min., the filter being situated in a building some distance from the rolling mill plant, to which it is connected by underground ducts. Two vertical-spindle, high-efficiency, axial-flow fans in the floor draw the air through the filter, force it along the underground ducts, and discharge it through the electrical machinery into the motor room. The passage of the air cools the apparatus, and a plenum is set up inside the room, thus preventing the entrance of dust at doorways, windows, &c.

The air filter is of the "Visco" patent rotating self-cleaning type. It consists of a number of metal baskets containing sinuous metal filter plates which divide the air stream into thin layers. The plates are coated with a thin film of "Viscinol," a blend of light viscous mineral oils. This type of filter may be built up to any desired capacity, but the one described here consists of thirteen sections arranged six on one wall and seven on the other. The rotating mechanism of each half is separate and is driven in each case by a 3-BHP motor; these motors are automatically switched on once a day by means of a time switch.



Part of "Visco" air filter equipment at one of the South Durham Steel & Iron Co.'s steel rolling mills

The plant which (apart from the fans) was designed and installed by the Visco Engineering Co., Ltd., is automatic and requires only routine attention for topping up oil levels and clearing away sludge collected in the main tank.

E.A.W. Activities

Yesterday the first E.A.W. welfare canteen was to leave London to operate among an anti-aircraft brigade stationed in the Chelmsford area. Presented to the Electrical Association for Women by Mrs. William Paterson, the canteen is painted blue and silver, the colours of the Association. The fully qualified personnel were trained in the E.A.W. Housecraft School. Members of the Association all over the country are providing a second canteen and a third has been offered by Mrs. R. W. Bingham for the duration of the war. These mobile welfare canteens, which will work in co-operation with the Welfare Department of the War Office and the Y.M.C.A., will bring the amenities of civil life to the men of searchlight and anti-aircraft units, and the service ranges from providing tea, cakes, fruit, tobacco, writing paper, &c., to ensuring the darning of socks and the regular laundering of the men's clothes. A travelling library is also a feature of the canteen.

Outstanding attractions of the summer programme of the E.A.W. London Branch include lectures on "Wartime Sweets and Savouries," by Miss N. D. Hansell (May 7th), "How Electricity Contributes to Safe Railway Working," by Mr. T. S. Lascelles, of the Interlocking Signal Co., Ltd. (May 22nd), and "Behind the Scenes in the B.B.C. in Wartime," by Miss E. I. Sprott (July 4th). A visit has also been arranged to the Crvselco Lamp Works at Bedford for June 19th. Home workers' classes commence this month.

Radio Price Increases

The General Electric Co., Ltd., has increased the prices of the following "Osram" valves:—HL210, L21, P215, QP21, SZ4, VS24K, X21, X23 and MSP4. The prices of the BC4018H and BC4010H receivers and the BC1935 and BC1936 loudspeakers have also been increased. The new prices took effect on May 1st.

Institute of Fuel Competition

The Council of the Institute of Fuel invites competition for a medal, together with a prize of books or instruments to the value of £5, to be awarded annually for a paper submitted by a student member of the Institute or by a student under twenty-five years of age of any university or technical college in the United Kingdom. The Council has decided that the paper shall deal with some subject relating to the preparation or utilisation of fuel, or allied subjects. Papers must be submitted to the secretary of the Institute, 30, Bramham Gardens, London, S.W.5, by September 1st, from whom full particulars of the competition can be obtained.

A National Savings Group

A war savings scheme has recently been launched among the employees of Bull Motors (E. R. & F. Turner, Ltd.), and is already operating with nearly 400 members. The scheme is in the hands of the Social and Athletic Club. The company lends the club the money necessary for the purchase of blocks of blank certificates, which are issued to the members.

Prices of Materials

Henry Gardner & Co., Ltd., report, May 1st: No change in the price of copper bars (best selected), sheet and rod, English pig lead, spelter and mercury. English block tin, £253 5s., 5s. decrease.

No changes in the prices of materials were reported on May 1st by Edward Till & Co. (india-rubber, Para fine), and F. Smith & Co (electrolytic copper bars, wire rods, and h.c. wire).

New Catalogues and Lists

Steatite & Porcelain Products, Ltd., Stourport-on-Severn.—A 62-page catalogue (S.P.9) covers all steatite and porcelain products, but deals particularly with pedestal and cylindrical post insulators, and describes their use both in Great Britain and abroad. It is fully illustrated by diagrams and photographs.

S.L.R. Electric, Ltd., 12a, Bourchier Street, Dean Street, London, W.1.—An illustrated leaflet of "S.L.R." and "Eca-Ray" lighting fittings and reflectors.

Switchgear & Equipment, Ltd., Southam Road, Banbury.—A leaflet on a new 250-MVA circuit-breaker conforming to BSS 116/1939.

Wholesale Fittings Co., Ltd., 23, Commercial Street, London, E.1.—A 56-page catalogue (No. 325) of the 1940 season's domestic appliances.

L. G. Hawkins & Co., Ltd., 30-35, Drury Lane, London, W.C.2.—A leaflet drawing attention to the fact that the "Halo Supreme" lighting pendant is now entirely British made. Also details of the new "Ferret" hand vacuum cleaner.

Mek-Elek Engineering, Ltd., 16, Douglas Street, London, S.W.1.—A circular illustrating a batch of adjustable lighting units for floor mounting.

Gent & Co., Ltd., Faraday Works, Leicester.—Catalogue Book 5, Section 2J, dealing with turret clocks.

Londex, Ltd., Anerley Works, 207, Anerley Road, London, S.E.20.—Leaflet No. 88, illustrating and describing a new two-step impulse relay, type LQA/FS.

Sloan Electrical Co., Ltd., 54, Fetter Lane, London, E.C.4.—Price revision supplement to the general catalogue.

M.K. Electric, Ltd., Wakefield Street, Edmonton, London, N.18.—Details of a new range of watertight plugs and sockets.

Metropolitan-Vickers Electrical Co., Ltd., 1, Kingsway, London, W.C.2.—Several leaflets relating to factory lighting in wartime, with special regard to the black-out, maximum production and maintenance.

Falk, Stadelmann & Co., Ltd., 83-93, Farringdon Road, London, E.C.1.—A leaflet describing a new "Efesca" boiling ring.

INFORMATION DEPARTMENT

GENERAL inquiries from readers relating to sources of electrical goods, makers' addresses, &c., are replied to by our Information Department through the post. Inquiries should be accompanied by a stamped addressed envelope.

Our extensive records enable us to reply to most queries, but occasionally we ask for our readers' assistance in tracing names and addresses not known to us. We should be glad to have such infor-

VIKING forks.

Insulated conduit similar to Bergmann type 1, 1½ and 2 cm. diameter.

Machinery for production of carbons for torch batteries.

MILLEES & COUTTS cable line connectors.

ELECTRICITY SUPPLY

Edinburgh and Glasgow Charges. Mortlake Crematorium Contract

Barking.—SUBSTATION PLANT.—The Electricity Committee is to renew and increase the plant at the Cape Asbestos Co.'s substation at a cost of £3,044.

Cardiff.—ACQUISITION OF PENARTH UNDERTAKING.—The Penarth Urban District Council has given its consent to a Special Order by which Cardiff Corporation would acquire the electricity undertaking and supply electricity to Penarth. At the outbreak of war the Corporation postponed its application for the Order, but the Electricity Commissioners subsequently intimated that the matter was not one which should be deferred.

PROSPECT OF HIGHER CHARGES.—A joint report of the city treasurer and city electrical engineer submitted at a meeting of the Electricity Committee last week revealed that the estimated deficiency on the undertaking to the end of March was £9,300. In addition, £9,000 was chargeable against the appropriation account for special expenditure. When these amounts were deducted from the revenue balance at March 31st, 1939, there remained £18,358. Large balances were, however, outstanding on hire-purchase account and stores in hand, and there was a bank overdraft of £139,569. It was recommended that there should be an increase in charges of approximately 10 per cent. to all consumers who did not pay under special agreements.

Councillor G. Baden Smith thought that the large power consumers who were doing well ought to pay more. Domestic consumers had already had £19,000 put on for meter rents. The Committee decided to appoint a sub-committee to investigate the circumstances and approach large industrial consumers.

Chapel-en-le-Frith.—SUPPLY TO MINERAL MINES.—The Trent Valley and High Peak Electricity Co. has obtained permission from the Rural District Council to erect an overhead line to the Derbyshire mineral mines at Peak Forest.

Clitheroe. — ELECTRICITY FOR LIME WORKS.—Mains are to be extended by the Corporation to provide an electricity supply to the Bellman Park lime works.

Coventry. — MAINS EXTENSIONS. — The Electricity Committee is to extend the mains at a cost of £4,870.

Edinburgh.—ELECTRICITY TARIFF PROSPECTS.—It was reported to the Public Utilities Committee on April 26th that it would not be necessary to raise the charges for electricity during 1940-41 so far as could be seen.

Glasgow.—CHARGES NOT TO BE ALTERED.—Last week the Electricity Committee decided not to alter the electricity charges in the city for the year 1940-41. Adjustments will be made to commercial and industrial service tariffs because of rising coal costs.

EMERGENCY LIGHTING SYSTEM.—The provision of an emergency electric lighting set in the north-western fire station at an estimated cost of £200 was recently proposed by the firemaster, but the Scottish Home Department has intimated that it is not prepared to approve of any expenditure in excess of £40.

Kettering.—EXPLOSION IN DISTRIBUTION BOX.—When an explosion occurred in a low-voltage electricity distribution AC network underground box in Lower Street, Kettering, on Saturday evening, a passer-by received slight cuts to the head. Inspection of the box, after removal, failed to reveal the cause of the explosion. The supply was not interrupted.

Lanarkshire.—DEARER COAL.—It is reported that Lanarkshire coal owners have notified increases of 2s. to 2s. 6d. per ton for supplies to public utility and industrial undertakings in Glasgow and the West of Scotland.

Lancashire.—TECHNICAL SCHOOL INSTALLATION.—The County Education Committee is seeking sanction to borrow £1,500 for rewiring the electrical installation at Darwen technical school.

Leicester.—STANDBY PLANT FOR GASWORKS.—The City Council is considering the construction of standby electrical plant at the Aylestone Road and Belgrave Gate gasworks at a cost of £3,200.

London.—ST. PANCRAS.—The Special Emergency (Finance and General Purposes) Committee has agreed to support the decisions arrived at by the Joint Conference of National Gas and Electricity Undertakings, which provide that during the war there shall be co-operation between the two industries for the protection of their mutual interests, the restriction of competition and the conservation of apparatus.

It has been decided to inform the London and Home Counties J.E.A. that as the Council does not offer facilities for the hire-purchase of domestic electrical apparatus it is not considered that the scheme for the transfer of hire-purchase agreements would be of any benefit to the Council's undertaking, or be consistent with its present policy.

A change-over from DC to AC at the garages of Carter Paterson & Co. in Pakenham Street and Wren Street has been approved, the Council to contribute £250 towards the cost.

Sanction has been received from the Electricity Commissioners to the borrowing of £2,469 for consumers' wiring installations and £3,986 for meters.

In order to supply essential services authority has been given for mains extensions estimated to cost £1,281.

The interim trading account reveals a decrease in the total sales of electricity for the December quarter, 1939, of approximately 25 per cent. compared with the corresponding period of 1938. Under normal conditions sales would probably have increased by about 5 per cent., so that the loss due to war conditions may be regarded as 30 per cent. The result of trading for the quarter was a net profit of £5,519 against £9,267 in 1938. The net profits for the June and December quarters totalled £14,952, and after setting against this sum the loss for the September quarter of £21,099 and the provision of £3,955 for an anticipated supplementary charge for increased fuel costs from the C.E.B. for 1939, the financial position is shown to be a loss for the three quarters of £10,102 against a net profit in the same period of the previous year of £2,549.

STOKE NEWINGTON.—It is proposed to adopt the suggestions outlined in a memorandum from the J.E.A. for the transfer of hire-purchase agreements between electricity undertakings.

BATTERSEA.—Sanction has been received to a loan of £31,000 for mains and services.

Lutterworth.—PROPOSED SUPPLY EXTENSION.—The Leicestershire and Warwickshire Electric Power Co. has applied to the Rural District Council for permission to erect overhead lines between Kibworth and Sapcote.

Middlesbrough.—PROPOSED SUBSTATION.—Plans have been approved for the erection of an electric substation in Acklam Road South for the Town Council.

Mortlake.—ELECTRIC CREMATORIUM FURNACE.—A suggestion that a third furnace should be installed was discussed by the Crematorium Board last week. The Management Committee recommended that the tender of Birmingham Electric Furnaces, Ltd., amounting to £2,485, should be accepted. Certain builders' work would also be necessary which, with architect's fee, would cost £255.

In reply to a question by Alderman A. E. Bernays, it was stated that the tender for a gas furnace, including flue, was £555. With contingent work the cost would be £1,000. On this point Alderman A. W. Aldis emphasised that maintenance charges over a number of years were of more importance than capital outlay. So far as the actual cost to the crematorium was concerned, in his opinion gas could be nothing like so cheap as electricity. The Committee's recommendation was adopted.

It was reported that nearly 400 cremations have been carried out during the crematorium's first year.

Northern Ireland.—EXTENSIVE SUPPLY FAILURE.—The most serious breakdown that has yet taken place on the Northern Ireland grid system occurred on Thursday last week, when the greater part of the counties of Antrim, Armagh, Down, Tyrone, Derry and Fermanagh were deprived of light and power for varying periods. The supposed cause was the shattering of insulators by lightning. The entire staff had to be called out to deal with the faults, which in some cases were widely separated, and it was not until after twelve hours that the system was fully tested and restored on over 500 miles of high-voltage and 493 miles of low-voltage line, including 394 substations. Belfast was only slightly affected.

Stoke-on-Trent.—STANDBY LIGHTING.—Emergency lighting is to be provided at Burslem and Longton report centres at a cost of £42.

DISTRIBUTION PROJECTS.—Consent has been obtained by the Electricity Committee to the erection of an overhead line to enable a supply to be given to Dimsdale Farm, Wolstanton. Arrangements have also been made with Parkhouse Collieries, Ltd., to provide supply to the colliery at Chesterton at a cost of £1,500. To facilitate network control in Station Road, Milton, a feeder pillar is to be provided at a cost of £240, and an additional transformer is being installed at Sneyd Green, at a cost of £400. An expenditure of £950 has been approved for augmenting the supply in the Bog Lane district of Lightwood, and proposed improvements to the supply in the Charles St. area, Hanley, will cost £220.

INSTITUTION HEATING.—The Health Committee has asked the electrical en-

(*Continued on page* 509.)

Water-power in Durham

A SCHEME for utilising water power in Upper Teesdale to generate electricity is put forward by Mr. G. F. Kennedy, who has investigated the matter for the South-West Durham Development Board. His report has been considered by the Executive Committee of the Board, which has submitted it for Government consideration.

The potentialities of the waterfall at Cauldron Snout have been investigated, the object being to facilitate by a cheap supply of electricity the development of industries in Teesdale and Weardale.

The report traces the course of the Tees from its source on Cross Fell. Basalt rock forms a natural dam capable of holding 1,250,000 cu. ft. of water, and the overflow from this dam forms the Cauldron Snout cascade into a ravine 135 ft. deep. Mr. Kennedy suggests that as the catchment area extends over 20 square miles a plentiful supply and head of water are assured. It is proposed that the volume should be augmented by the construction of an 8-ft. concrete dam which would increase the natural storage by a further 2¼ million cu. ft., making a total of nearly 4 million cu. ft.

A suggested hydro-electric scheme, capable of producing approximately 2,000,000 kWh annually, is outlined. At Langdon Beck, Mr. Kennedy suggests that a charge engineer's house might be built for the control and maintenance of a power station. A pipe-line of 28 in. diameter steel pipes 1,200 ft. in length housed in a concrete duct or tunnel in order to protect it and to avoid spoiling the amenities of the district is advised, and this, as well as the dam, could be surfaced to resemble the natural contour and appearance of the surrounding terrain.

The volume of water thus secured is calculated to operate a 21-in. diameter twin impulse type turbine directly coupled to a 150-kW alternator. The initial outlay is estimated at £29,000. The annual overhead and maintenance costs of the scheme, which would require the services of only one regular attendant as it would be automatically controlled, are calculated to yield a supply at an average cost of ¼d. per kWh.

NEW PATENTS

Electrical Specifications Recently Published

Compiled by a firm of chartered patent agents. The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (1s. *each*) *can be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2.*

1938

13915. "Cathode-ray tubes." A. C. Cossor, Ltd., L. H. Bedford, L. Jofeh and W. H. Stevens. May 10th, 1938. (519668.)

19523. "Electric oscillation generators." Telephone Manufacturing Co., Ltd., and L. H. Paddle. July 1st, 1938. (Cognate application 24014/38. (519672.)

22657. "Automatic train-control systems." J. Boot, and General Railway Signal Co., Ltd. July 29th, 1938 (519772.)

24722. "Sound-reproducing devices." G. R. Fountain and H. J. Houlgate. August 23rd, 1938. (519625.)

25054. "Electric-discharge lamps." J. H. G. Pearce, and Pearce Signs, Ltd. August 25th, 1938. (519719.)

25406. "Thermionic oscillators." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. September 2nd, 1937. (519720.)

27608. "Dynamo-electric generators." Westinghouse Electric & Manufacturing Co. September 23rd, 1937. (519629.)

27658. "Means for controlling the temperature of electric heating apparatus." British Thomson-Houston Co., Ltd., R. S. Gilling and K. J. R. Cocke. September 22nd, 1938. (519684.)

27662. "Television systems." Kolster-Brandes, Ltd., and W. A. Beatty. September 22nd, 1938. (519631.)

27695. "Means for operating vapour- or gas-filled electric-discharge lamps or tubes." Ionlite, Ltd., and W. A. Stickley. September 22nd, 1938. (519685.)

27750. "Devices for periodically interrupting an electric circuit." W. B. Elmer. September 23rd, 1938. (519687.)

27758. "Centrally controlled electrical alarm device." C. Leti. September 23rd, 1937. (Cognate application 27759/38.) (519688.)

27931. "Electrical measuring instruments." Evershed & Vignoles, Ltd., and R. T. Wright. September 24th, 1938. (519693.)

27942. "Electric wiring installations." Siemens Schuckertwerke Akt. Ges. September 24th, 1937. (Addition to 470121.) (Cognate applications 27943/38.) (519636.)

27976. "Coin-freed prepayment mechanism for meters." Meters, Ltd., and R. T. Brown. September 26th, 1938. (519639.)

27991. "Electric motor control systems." General Electric Co., Ltd., and H. J. Coates. September 26th, 1938. (519697.)

27992. "Electrical apparatus comprising parts for containing liquid having electrical insulating properties." General Electric Co., Ltd., and H. J. Coates. September 26th, 1938. (519821.)

28009. "Receivers for audio electric currents." Automatic Telephone & Electric Co., Ltd., and P. N. Roseby. September 26th, 1938. (519822.)

28023. "Stems for electron-discharge devices and the like." Marconi's Wireless Telegraph Co., Ltd. September 15th, 1937. (519642.)

28024. "Electron-discharge devices." Marconi's Wireless Telegraph Co., Ltd. September 25th, 1937. (519643.)

28049. "Variable electrical inductances." B. N. Maclarty. September 26th, 1938. (Addition to 516814.) (519647.)

28082. "Electric smoothing irons." Simplex Electric Co., Ltd., and P. W. Davis. September 27th, 1938. (519828.)

28109. "Photo-electric cells." British Thomson-Houston Co., Ltd. September 29th, 1937. (519830.)

28113. "Telephone receivers." Standard Telephones & Cables, Ltd., L. C. Pocock and J. S. P. Roberton. September 27th, 1938. (519654.)

28140. "Withdrawable electrical switchgear." D. R. Davies, and Metropolitan-Vickers Electrical Co., Ltd. September 27th, 1938. (519658.)

28154. "Current-collectors for trolley-buses and other electric road vehicles supplied from overhead wires." F. Szalay. June 17th, 1938. (519726.)

28169. "Television receivers." Marconi's Wireless Telegraph Co., Ltd. September 29th, 1937. (519727.)

28248. "Impulse-senders for use in telephone or like system." Automatic Telephone & Electric Co., Ltd., C. R. Woodland, J. W. McClew and E. I. Houghton. September 28th, 1938 (519733.)

28276. "Frequency-control systems in high-frequency electric circuits." F. W. Cackett and T. G. Thorne. September 29th, 1938. (519703.)

28333. "Electric indicating, measuring or control apparatus." Foster Instrument Co., Ltd., and A. L. Douglas. September 29th, 1938. (519705.)

28334. "Electrical temperature-sensitive devices." Foster Instrument Co., Ltd., C. E. Foster and C. A. F. Fennell. September 29th, 1938. (519783.)

28353. "Electrical mechanism for controlling a flexible traction member." V. B. M. Mallentjer. April 12th, 1938. (519839.)

28480. "Electric cables." Standard Telephones & Cables, Ltd. (G. Deakin). (September 30th, 1938. (519744.)

28481. "Telephone secrecy equipment." Standard Telephones & Cables, Ltd., and F. G. Filby. September 30th, 1938. (519745.)

28482. "Electric resistances." Standard Telephones & Cables, Ltd., and H. Wolfson. September 30th, 1938. (519746.)

28484. "Electron-discharge apparatus." Kolster-Brandes, Ltd., and W. A. Beatty. September 30th, 1938. (519747.)

28485. "Radio telephone-circuit arrangements." Standard Telephones & Cables, Ltd., and R. A. Meers. September 30th, 1938. (519748.)

28531. "Carrier-wave receiving apparatus." L. L. De Kramolin. October 4th, 1937. (519786.)

28598. "Electrical make-and-break switches with sparking-preventing arrangements." J. B. Dixon. October 1st, 1938. (519756.)

28646. "Television transmitting arrangements." Radioakt Ges. D. S. Loewe. October 5th, 1937. (519757.)

28685. "Thermionic amplifying systems." Rediffusion, Ltd., and P. Adorjan. October 3rd, 1938. (519846.)

28728. "Domestic washing machines and the like fitted with electric immersion heaters." Co-operative Wholesale Society, Ltd., and R. H. Line. October 4th, 1938. (519849.)

28776. "Electrical switching apparatus especially adapted for use with pneumatic-tube conveying systems." Lamson Engineering Co., Ltd., and A. Besson. October 4th, 1938. (519852.)

28779. "Alternating-current electric measuring and like instruments." Elliott Bros. (London), Ltd., and G. F. Shotter. October 4th, 1938. (519853.)

28785. "Vacuum electric-discharge devices." British Thomson-Houston Co., Ltd., L. Rushforth and J. T. Anderson. October 4th, 1938. (519854.)

28789. "Thermionic valves." Standard Telephones & Cables, Ltd., and F. D. Goodchild. October 4th, 1938. (519810.)

28790. "Electric measuring apparatus." Standard Telephones & Cables, Ltd., and G. G. Samson. October 4th, 1938. (519811.)

28862. "Electric cables." Siemens Bros. & Co., Ltd., and H. G. Wood. October 5th, 1938. (519862.)

28863. "Electric cables." Siemens Bros & Co., Ltd., H. G. Wood and J. Riedl. October 5th, 1938. (Cognate application 30791/38.) (519863.)

28864. "Joints for electric cables." Siemens Bros. & Co., Ltd., and H. G. Wood. October 5th, 1938. (519864.)

30373. "Dynamo-electric generators." Westinghouse Electric & Manufacturing Co. November 27th, 1937. (Addition to 519629.) (519662.)

1939

12614. "Transmission systems for ultra-high-frequency electro-magnetic waves." Electrical Research Products, Inc. April 29th, 1938. (519766.)

14004/5. "Couplings for electric circuits." A. C. Cossor, Ltd., L. H. Bedford, L. Jofeh and W. H. Stevens. May 10th, 1938. (Divided out of 519668.) (519714/5.)

1940

1402. "Electrostatic separators." Ritter Products Corporation. July 3rd, 1937. (Divided out of 519817.) (519770.)

Electricity Supply (*Concluded*)

gineer to obtain tenders for heating renewals at the Institution. The estimated cost is £580.

Stoke St. Gregory.—SUPPLY EXTENSION HELD UP.—At a recent Council meeting a letter was read from Mr. L. V. Turner, manager of the Taunton Electricity Department, pointing out that no further extension of electricity could be made at Curload, as the Department had been unable to obtain permission to erect high-voltage lines over land belonging to the Baptist Chapel. The Council is sending a deputation to discuss the matter with Mr. Turner.

RADIO AND TELEPHONY

Germany.—TELEVISION SERVICE MAINTAINED.—Television programmes are being continued in Germany in spite of the war, states the official German news agency. Recently the German-Italian football match and international winter sports competitions at Garmisch-Partenkirchen were televised, it says.—*Reuter.*

Great Britain.—INCREASED TELEPHONE AND TELEGRAPH CHARGES.—In his Budget speech last week the Chancellor of the Exchequer announced that in the inland telephone service there would be a general increase of 15 per cent. on all charges to subscribers with exchange facilities and to users of coin-box telephones. These increases would take effect as from May 1st in the case of trunk calls and all calls from public call offices, and from July 1st in the case of rentals and miscellaneous charges. The increased charges for subscribers' local calls would apply to all calls made after the date on which subscribers' meters were read towards the end of June. For private telephone services the increase would be 25 per cent., and would operate from July 1st.

In the case of the inland telegraph services there would be a fixed additional charge of 3d. on each ordinary, priority, or greetings telegram, on each night telegraph letter and on each page of Press telegrams. These additional charges would operate as soon as possible after the passing of the necessary legislation. Charges for private telegraph services would be increased by 25 per cent. on July 1st.

Hull City Council's telephone system, which is the only one owned by a municipality in this country, is to increase its charges. Mr. W. S. Morrison, the Postmaster-General, has notified the Corporation that the 15 per cent. Budget increase will apply to its service.

RADIO RELAY WARNING SYSTEM.—An air-raid warning system which is operated over radio relay service lines was demonstrated at Dudley on April 17th, those present including officers of the Ministry of Home Security and members and officials of the Dudley and Smethwick Corporations. The idea was originated by Councillor A. L. Hillman (Chairman, Dudley A.R.P. Committee) in a scheme for the reorganisation of A.R.P. services, and it is claimed that a saving of £10,000 yearly would be effected in Dudley alone.

A warning signal is transmitted from A.R.P. headquarters to the radio relay station and then relayed over the network to loudspeakers in the homes of volunteers who, if they desire, can listen to the radio relay programme, in which case the signal would be superimposed.

Iran.—BROADCASTING SERVICE.—The Crown Prince of Iran inaugurated a broadcasting service at an impressive ceremony at Teheran last week. The ceremony was broadcast on a wavelength of 19.87 metres.—*Reuter.*

FINANCIAL SECTION

New Companies. Debenture Charges. Bankruptcies and Liquidations. Reports and Dividends. Stocks and Shares

New Companies Registered

Universal Power Transmissions, Ltd.—Private company. Registered April 20th. Capital, £2,000. Objects: To acquire letters patent, brevets d'invention, concessions, licences, inventions, rights and privileges; and to carry on the business of electricians, mechanical engineers and manufacturers and workers of and dealers in electricity, motive power and light, &c. The subscribers are: A. M. Taylor, 53, Harborne Park Road, Birmingham, 17, and S. Rykwert, 26, Eyre Court, N.W.8. Secretary: Joe Gordon.

Ashtead Electric Cable Drums, Ltd.—Private company. Registered April 26th. Capital, £900. Objects: To carry on the business of cable drum and reel makers and dealers, manufacturers of and dealers in cables, chains, belts, wires, cords, mechanical and electrical machinery, &c. Permanent directors: Wm. A. S. King, Frilsham House, Barnett Wood Lane, Ashtead, J. Whipps, Ancona, The Drive, Lower Road, Fetcham (general manager of General Cable Manufacturing Co., Ltd.), and B. I. M. Bussy, 63, Kingston Road, Leatherhead. Registered office: 171, Shaftesbury Avenue, W.C.2.

Lawley Electric Storage Co., Ltd.—Private company. Registered April 27th. Capital, £3,000. Objects: To carry on the business of electricians, electrical, mechanical and civil engineers and contractors, suppliers of electricity, manufacturers of and dealers in all batteries, &c. L. D. Pooley, 4, Great Queen Street, W.C., is permanent director so long as he holds 500 shares. Registered office: 4, Great Queen Street, W.C.2.

Pearcy & Co., Ltd.—Private company. Registered April 15th. Capital, £500. Objects: To carry on business as importers and exporters of and dealers in electrical goods, lamps, fires, cookers, &c. C. J. Hayward, "Holmlea," 33, Lady Somerset Road, N.W.5, is first director. Registered office: 49, Bedford Row, London, W.C.1.

Electrothermal Engineering, Ltd.—Private company. Registered April 22nd. Capital, £1,000. Objects: To carry on the business of manufacturers of and dealers in resistances, wires, thermostats, switches and all classes of appliances applicable to electrical heating, &c. The directors are: H. Goldstaub, 73, Hermitage Court, Snaresbrook, E.18, and W. Jenkins, 21, West Park Avenue, Lytham St. Annes. Registered office: 73, Hermitage Court, Snaresbrook, E.18.

Companies' Returns

Mortgages and Charges

Record Electrical Co., Ltd.—Particulars filed of debentures, not exceeding £28,950, authorised March 20th, 1940, charged on the company's undertaking and property, present and future, including uncalled capital, the amount of the present issue being £28,950.

Euston Manufacturing Co., Ltd.—Issue on February 29th, 1940, of £100 debentures, part of a series already registered.

Receivers Appointed and Released

Sign Construction Co., Ltd.—A. H. Partridge, 3, Warwick Court, Gray's Inn, W.C.1, was appointed receiver under powers contained in agreement dated August 20th, 1934.

Diamond Lamp Shade Co., Ltd.—Albert Grierson, of 21, Spring Gardens, Manchester, 2, was appointed receiver and manager on April 10th, 1940, under powers contained in instruments dated April 26th, 1935, and August 18th, 1939.

Herts Radioelectric, Ltd.—Albert E. Attwood, of 76, Finsbury Pavement, E.C.2, was appointed receiver and manager on March 4th, 1940, under powers contained in debenture dated April 19th, 1939.

Universal Lighting Co., Ltd.—Harris Rainsbury, of 133-9, Finsbury Pavement, E.C.2, ceased to act as receiver on April 3rd, 1940.

Supremus Specialities, Ltd.—Reginald Roper, of 60, Newhall Street, Birmingham, 3, ceased to act as receiver and/or manager on April 5th, 1940.

John Holder & Co., Ltd.—C. H. Travis, 2, Bloomsbury Street, W.C.1, ceased to act as receiver and manager on March 26th.

Forward Electric Co., Ltd.—Sir Chas H. Smith, of Eden Place Chambers, 71, Edmund Street, Birmingham, ceased to act as receiver and/or manager on April 16th, 1940.

Company Liquidations

Rayner Brothers (1934), Ltd., electrical engineers, 1a, Oswald Road, Scunthorpe, Lincs.—A meeting of the creditors was held recently at Hull, when Mr. L. J. Rayner, one of the directors of the company, presided. The nominal capital was £1,000. A statement of affairs disclosed liabilities of £719, with a deficiency, as regarded the creditors, of £441. A resolution was passed confirming the voluntary liquidation of the company with Mr. W. B. Hall, of Hull, as liquidator, with a committee of inspection.

William Garner & Co., Ltd.—Winding up voluntarily. Liquidator, Mr. V. W. Bell, 27 and 28, Old Jewry, London, E.C.2.

Beeney Bros. (Hailsham), Ltd.—Winding up voluntarily. Liquidator, Mr. A. E. Orbell, 6-7, Old Steine, Brighton.

Phœnix Tester, Ltd.—Particulars of claims by May 23rd to the liquidator, Mr. A. C. Penney, 53, Great Marlborough Street, London, W.1.

Magnus Volk, Ltd. — Particulars of claims by May 25th to the liquidator, Mr. F. V. Arnold, Regent House, Princes Place, North Street, Brighton.

Autocar Electrical Co., Ltd.—Meeting, pursuant to Section 236 of the Companies Act, 1929, to receive an account of the winding up by the liquidator. Mr. E. B. Wake.

MacGregor & McCallum, Ltd.—Winding up voluntarily. Liquidator, Mr. C. B. V. Young, 8, Laurence Pountney Hill, E.C.

Northleach Electric Supply Co., Ltd.—Winding up voluntarily. Liquidator, Mr. A. D. Ward, Bank Chambers, Northleach, Glos.

A. Arc (1938), Ltd.—Final meeting of members, pursuant to section 236 of the Companies Act, 1929, at 52A, Goldhawk Road, Shepherds Bush, London, W.12, to receive an account of the winding-up by the liquidator, Mr. L. M. Neumann.

Bankruptcy Proceedings

H. White, radio and electrical engineer, Ridgeway Lane, near Ambergate, and lately trading at 38, Nottingham Road, Ripley.—First and final dividend of 1s. 0½d. in the £, payable May 7th at 22, Regent Street, Park Row, Nottingham.

H. H. Moore, jun., electrical engineer, "The Lindens," West Cliff Gardens, Bournemouth. — Application for discharge to be heard on May 20th at the Law Courts, Bournemouth.

J. Stubbs and **J. A. P. Boulton** (John Stubbs & Co.), electrical engineers, 39, Bootham, York.—Last day for receiving proofs for dividend May 4th. Trustee, Mr. J. H. Moore, The Red House, Duncombe Place, York.

G. C. Pinney and **A. E. Miller** (Granby Service Co.), wireless and electrical dealers, 4, Granby Street, Littleport.—First and final dividend of 1s. 10d. in the £, payable May 15th at 4, Charterhouse Square, London, E.C.1.

Reports and Dividends

Laurence, Scott & Electromotors, Ltd.—Presiding at the annual meeting held on April 24th Mr. G. J. Scott (chairman) said that before the outbreak of war both their Norwich and Manchester works were employed to their full normal capacity, but were capable of further expansion of output. Since the early days of the war this capacity for increased production had stood them in good stead, as it had enabled them to meet the demands of expanding war industries, as well as to manufacture for the export trade.

The superiority of the new range of standard electric motors developed and perfected at their Manchester works during the last two years had now been proved by results. The extension of their activities to a new field of electrical engineering referred to at the last meeting had already proved an out standing success. Moreover, they had good reason to believe that, after the war, this new type of machine would find many new applications.

The Electric Supply Corporation, Ltd.—At the annual meeting on April 29th Mr. A. J. Fippard, M.I.E.E. (chairman) said that the consent of the Treasury to the proposed capitalisation of reserves had been received but after the Chancellor's budget speech he visited the Treasury and was informed that it would be appreciated if the company would voluntarily postpone its intentions.

Their proposals were quite innocuous in that the capitalisation was to be from reserves built up out of capital profits derived in the main from the sale of undertakings which, for many years, had not made an adequate return on the money invested in them but which, having been developed at their expense, were eventually sold at a substantial capital profit. In their own undertakings and their subsidiary companies they had invested over £1,000,000 and far from earning 12 per cent. on that amount, the gross earnings were only 5 per cent. and well below 5 per cent. on the money actually employed. Their income was increased from outside investments which brought them in an average of nearly 7½ per cent. on the money they paid for them. Notwithstanding these facts, the directors felt that it would be wrong at this stage to make use of the Treasury consent.

A great number of supply authorities increased charges for electricity soon after the war commenced, but no increase had yet been made by any of their undertakings. He did not say that they would be able to continue the present charges, which in the areas of their Sussex companies were unusually low.

Hall Telephone Accessories (1928), Ltd.—Presiding at the annual meeting held on April 25th Major M. Guest, M.P. (chairman) said that the war had thrust immense changes upon the company. Their output now consisted almost entirely of work under contracts for various Government Departments, among which was still included the G.P.O. As to the current year, their order book was very much larger than ever before.

The Southern Areas Electric Corporation, Ltd., reports a net profit for 1939 of £30,042, as compared with £31,985 for 1938. The final dividend is 3 per cent., making 5 per cent. for the year (same) and £24,780 is carried forward (against £19,614 brought in).

The annual meeting is being held today (Friday), and in his speech to shareholders which has been circulated in advance, Viscount Elibank (chairman) says that their experience during 1939 has been similar to that of most electricity supply undertakings. To meet the loss of revenue in certain areas and the increased costs they have found it necessary to raise their tariffs in those areas most adversely affected, but not in all. That they have not been unfair to their consumers is evident from the

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STOCKS AND SHARES

TUESDAY EVENING.

THERE can be no doubt as to what is the principal feature of the Stock Exchange markets at the present time. The manner in which the prices of War Loan, Consols, and other British Government securities have forged ahead is, by itself, a sufficiently arresting movement to attract general notice. It has taken place, however, at a time when business in markets generally has turned listless and uninteresting, making the strength of gilt-edged stocks so much the more prominent.

For this strength, the Budget provisions are mainly responsible. They derive an extra stimulus from the investment of money distributed this week in connection with the Treasury's plan of acquiring American securities. Industrial companies' stocks and shares have been moving irregularly, the determining factor in the fluctuations being the standard of distribution that they will be permitted to make under the limitation of dividends imposed by the Budget.

Limitation of Dividends

Whatever may be the feelings of holders of ordinary shares about the principle of limiting dividends and banning bonuses, the markets have reflected little concern as to the way in which the proposal will work out in practice. Indeed, it took very little time for the initial surprise and doubt to be replaced by reassurance. Hard cases have come to light in some directions; hopes have been scotched in others; and uncertainties still abound. But the prospect of "special consideration" causes judgment to be suspended by those who appear likely to be chiefly affected: it is hoped—perhaps piously—that the position can generally be no harder than a matter of benefits postponed. Rates of dividends paid in the three pre-war years will satisfy most anticipations. Possibly a preference might be to the building up of reserves rather than to dividends. The law, in fact, is making a virtue out of a necessity.

Special Cases

British Electric Traction deferred stock jumps to the eye as an example of hardship which, without special treatment, may arise through the Budget proposals relating to dividends and bonuses. Debarred from distributing the 10 per cent. scrip bonuses which for years have constituted the bulk of the stockholders' return, the company will apparently be prevented, also, from increasing the relatively much smaller cash payments. These were stabilised at 5 per cent. until 1939, although last October the Board declared an interim cash dividend of 15 per cent., having decided to drop the bonus policy for the time being. Such a situation looks so inequitable that special dispensation seems inevitable. That stockholders have been given a scare, however, is evident from bargains recorded, on the day after the Budget, down to 600; no less than 145 points below the quotation of the day before. The price has since recovered a trifle, on a more hopeful assessment of the chances of relief, but the fall on the week is still 120, at 625.

Johnson and Phillips

In a smaller way, Johnson & Phillips shares have been disturbed by the impression that the new rule puts out of court any increase above last year's 12½ per cent. dividend. Considerable hopes have been built on that possibility, as a sequel to the raising of the interim payment from 5 to 7½ per cent. The final dividend, now due, will cover the year ended in December. The Chancellor has stated that any financial year ending later than last June will count as a "war" year for the purposes of the Act. Johnson & Phillips are left therefore with 12½ per cent. as the best standard dividend. Since the market had been counting on a distribution of at least 15 per cent., the shares have been marked down by a florin to 48s. 9d., making the yield about 5⅛ per cent. on the maximum dividend paid in the pre-war years.

Preference Shares Benefit

For the security of preference shares as a class, the limitation of dividends on ordinary capital is recognised as being all to the good. While the merits of a preference share are commonly judged by the extent to which the dividend is covered by earnings, weight is, of course, attached to the amount of assets behind the capital. Surplus profits withheld, perforce, from distribution must be devoted in future to increasing assets in one form or another. Whether a company chooses to add to its plant, its investments or to employ its undistributed funds in any other way, the result should fortify the backing for the preference capital. Argument on these lines has found expression not so much in an advance of preference share quotations as in a further diminution of the supply of stock.

In the electricity supply market, South Metropolitan Electric 4 per cents. remain on offer in fair quantity at just over 20s., and some of the 6 per cent. issues can be bought to yield from 4 to 4½ per cent. Among electrical equipment preference shares, General Electric 6½ per cents. are offered at 31s. 6d., giving a return of 4¼ per cent., and the 7½ per cents. at 34s. 9d., yielding just over 4¼ per cent. on the money. It has been made plain that a company is not debarred from paying off any arrears of dividend that may be outstanding. For participating preference shares, the maximum distribution is to be the amount paid in the standard years in respect of the ordinary dividend, plus participating rights.

After a spell of uncertainty as to the proper interpretation of certain points in the Chancellor's Budget proposals, it transpires that companies whose maximum dividend in the three pre-war years failed to reach 4 per cent., will be allowed as a rule to make a distribution—if the profits permit—up to that limit. By "dividend," the Chancellor means the rate distributed before the deduction of tax. This ruling has implications for the shares of, for instance, Ericsson Telephones and some of the overseas electricity concerns, on which dividends are declared free of income tax. Adjustments will have to be made in these cases so that the gross equivalent of the dividend is no greater than in the standard year, allowing for tax differences. Where there have been changes in capital since the war, special provisions are promised.

Ever Ready Results

Shareholders in Ever Ready are doubly fortunate in that a 50 per cent. increase in the year's sale of batteries has enabled their company not only to expand the profits, but to give them the benefit of the increase without running up against the new dividend restrictions. Indeed, after raising the payment by 10 per cent. to 40 per cent., the company still has 5 per cent. in hand by virtue of the 45 per cent. distribution made in 1937. The excellent profits made in that and the preceding year appear to have given the company another point of advantage in providing a useful basis for E.P.T. calculations. This has doubtless helped towards the increase in net profits, according to the preliminary statement, from £457,000 to £632,000. The results more than fulfilled expectations which, having regard to all the circumstances, had already been pitched fairly high. After advancing by 1s. 3d. to 28s., the price came back to 27s. 6d. on a bout of profit-taking. At that price the 5s. shares offer a yield of 7½ per cent., allowing for the dividend, about 9d. net, included in the price.

Home Rails

After turning over the new dividend restrictions for suspicious examination in every light, the Home Railway market has more or less made up its mind that the limit applies to the stocks, but is satisfied that the consequences are likely to be no serious matter. Dividends on the junior stocks can evidently rise to the Chancellor's 4 per cent. maximum. If the companies succeed in reaching that limit, most stockholders will, it is safe to say, be gratefully surprised, the Great Western being the only one of the four main line concerns to have paid as much as 4 per cent. on its most junior stock for some years. Buying of the more senior railway issues has been this week's feature of the market. Southern 5 per cent. preference, for instance, has risen from 98½ to 100½; the 5 per cent. preferred is a point to the good at 71. The newfound strength of the gilt-edged market called attention to the relatively attractive yields obtainable from Home Railway prior charges—which mostly enjoy ample security, for the duration of the war, by virtue of the Government guarantee.

Equipment and Manufacturing

Most electrical equipment companies were able to pay good enough dividends between mid-1936 and mid-1939 to remove any serious cause for regret that these cannot for the present be exceeded. In one or two cases there is headroom for some improvement on the last-paid dividends. Callender's Cable, for instance, could restore the rate of distribution to 20 per cent., as compared with the last of 15 per cent., if profits allowed and the directors felt so disposed. Others which appear to be similarly placed include Chloride Electrical Storage, Hall Telephone, Lancashire Dynamo, Mather & Platt and Westinghouse Brake. The first-named shares rose half a crown, to 3⅜, on the implications of the Ever Ready results. Mather & Platts, on the other hand, have taken a dull turn to 38s. 9d. Enfield Cables, at 52s. 6d., and Crompton Parkinson at 17s. 6d., are other dull spots, but one or two improvements are also recorded. Walsall Conduits' preliminary figures made a good impression; there is no difficulty in maintaining the dividend at 55 per cent. The 4s. shares, at 26s. 3d., return well over 8 per cent. on the money. On none of the popular electrical shares does there appear to rest any obligation to cut the recent rates of dividend.

Miscellaneous Matters

Several bull points for the gilt-edged market are apparent in the Budget. One was the relief from any increase in the income-tax; another, the assumption that company profits will be diverted on a considerable scale, by the dividend limitation rule, into gilt-edged investments. As a whole, indeed, the Budget was considered to favour gilt-edged issues at the expense of ordinary shares. Prices have gone ahead cheerfully, with the new 3 per cent. War Loan changing hands at over 100 for the first time. Electricity supply shares have remained almost unmoved by the week's events. The Electric Supply Corporation has withdrawn its projected offer of new shares, in deference to the Budget's ban upon new issues. Cable & Wireless ordinary stock, at 57½, has failed to recover the drop of 2½ points which followed the decision to pay a 4 per cent. dividend for the second year in succession. The 5½ per cent. preference put on 2 points, to 98, in reflection of the increased popularity of fixed-interest securities as a whole. For a similar reason, Anglo-American Telegraph 6 per cent. preferred is 2 higher at 103½; the deferred advanced to 23.

D

ELECTRICAL COMPANIES' SHARES

Prices, Dividends and Yields

Company	1940 High-est	1940 Low-est	Dividend Pre-vious	Dividend Last	Price April 30	Rise or Fall	Yield p.c. £ s. d.
Home Electricity Companies							
Bournemouth and Poole	63/6	57/–	15	15	61/3	–⅛	4 17 10
British Power and Light	30/–	25/3	7	7	28/–	—	5 0 0
City of London	28/–	25/6	7½	7½	25/6	—	5 17 8
Clyde Valley	38/6	33/–	8	8	37/–	—	4 6 5
County of London	43/3	34/6	10½	10½	36/3	—	5 16 0
Edmundson's :							
7% Pref.	31/6	28/–	7	7	31/3	—	4 9 7
Ord.	27/6	21/9	9	6	25/–	–	4 16 0
Elec. Dis. Yorkshire	40/3	35/9	9	9	38/9	—	4 16 0
Elec. Fin. and Securities	41/3	40/–	12½	12½	41/3	—	6 1 0
Elec. Supply Corporation	46/3	41/–	12	11½	46/3	—	4 19 7
Isle of Thanet	16/–	15/–	4	4	15/–	—	5 6 8
Lancs Light and Power	33/–	28/6	7½	7½	31/3	—	4 16 0
Llanelly Elec.	21/–	19/6	5½	5½	21,–	—	5 4 9
Lond. Assoc. Electric	21/–	18/9	7	5½	20/	+⅛	5 0
London Electric	37/6	25/9	8	7½	25/9	—	5 12 8
London Power Deb. Red.	105½	103	5	5	104½	—	4 15 6
Metropolitan	41/6	36/–	12	10	36/3	—	5 10 4
Midland Counties	39/–	32/9	8	8	36/3	—	4 8 6
Mid. Elec. Power	40/–	36/–	8	9	38/9	—	4 13 0
Newcastle Elec.	29/9	26/–	7	7	27/6	—	5 1 10
North Eastern Electric :							
Ordinary	31/6	26/6	7	7	29/–	—	4 16 7
7% Pref.	32/6	30/–	7	7	31/6	—	4 9 0
Northampton	48/–	41/–	10	10	42/6	—	4 15 0
Notting Hill 6% Pref. (£10)	10⅜	10	6	6	10⅜	—	—
Northmet Power :							
Ordinary	42/3	35/6	10	10	37/–	—	5 8 1
6% Pref.	29/–	26/9	6	6	28/–	—	4 5 9
Richmond Elec.	24/6	22/9	7	6	23/9	—	5 1 1
Scottish Power	38/–	31/9	8	8	35/9	—	4 9 6
Southern Areas	21/3	18/6	5	5	20/–	—	5 0 0
South London	23/3	22/–	7	7	22/6	—	6 4 3
West Devon	20/–	18/9	5	5	18/9	—	5 6 8
West Glos.	21/3	16/6	2	2½	21/3	—	2 10 0
Yorkshire Elec.	40/–	33/3	8	8	38/9	—	4 2 5
Overseas Electricity Companies							
Atlas Elec.	4/–	2/6	Nil	Nil	4/–	+9d.	—
Calcutta Elec.	37/–	30/–	10*	8*	33/–	—	4 17 0
Cawnpore Elec.	30/–	28/6	10	10	28/9	—	—
East African Power	25/6	23/3	7	7	25/6	+6d.	5 19 10
Jerusalem Elec.	24/–	21/6	7	7	24/–	—	5 16 8
Kalgoorlie (10/–)	12/6	9/6	7½	7	12/6	—	5 12 0
Madras	26/9	26/–	8*	8*	26/3	—	—
Montreal Power	35½	31	1½	1½	35	—	—
Palestine Elec. "A"	25/–	23/–	7½*	5*	23/9	—	4 4 3
Perak Hydro-electric	20/3	16/3	6	2½	16/3	–⅛	3 1 6
Shawinigan Power	27¼	20	83cts.	90cts.	25	—	—
Tokyo Elec. 6%	69	50½	6	6	62½	–2	9 12 0
Victoria Falls Power	75/9	67/9	12½	15	75/–	+6d.	4 0 0
Whitehall Investments Pref.	17/9	12/6	7½	7½	16/–	—	9 7 6
Public Boards							
Central Electricity :							
1950–70	110½	107	5	5	109	—	4 11 7
1955–75	112½	108½	5	5	111	—	4 10 0
1951–73	107½	103	4½	4½	107	—	4 4 0
1963–93	96½	90	3½	3½	95½	—	3 13 8
London Elec. Trans Gtd.	92	87½	2½	2½	91	—	2 15 0
London & Home Counties							
1955–75	113¾	106½	4½	4¾	106½	—	4 4 6
Lond. Passenger Transport							
A	116	104	4½	4½	109½	+1	4 2 0
B	116	103	5	5	109½	—	4 11 4
C	65½	42¾	1½	—	44	—	—
West Midland Joint Elec., 1948–68	106½	105	5	5	106½	—	4 14 0
Telegraph and Telephone							
American Tel. & Tel.	215	205	9	9	212½	—	4 4 8
Anglo-Am. Tel. :							
Pref.	103½	93½	6	6	103½	+2	5 16 0
Def.	23¾	21	1½	1½	23	+1	6 10 4
Anglo-Portuguese	22/6	19/9	8	8	22/6	+6d.	7 2 6
Cable & Wireless :							
5½% Pref.	99⅜	94	4½	5½	98	+2	5 12 3
Ord.	65	56	4	4	57½	—	6 19 2
Income	99¾	93	—	—	99½	—	4 0 5
Canadian Marconi $1	6/–	4/6	Nil	4cts.	5/6	—	—
Globe Tel. & Tel.							
Ord.	32/6	28/6	7½*	7½*	32/6	—	4 12 4
Pref.	28/9	24/6	6	6	27/6	—	4 7 3
Great Northern Tel. (£10)	20	12	20	20	14	—	14 5 8
Inter. Tel. & Tel.	5¾	4½	Nil	Nil	5	—	—
Marconi-Marine	30/–	26/3	7½	10	26/3	—	7 5 6
Oriental Telephone Ord.	2⅞	56/–	12*	12*	2⅞	—	4 5 5
Telephone Props.	15/–	13/3	5	6	15/–	—	8 14 6
Telephone Rentals (5/–)	9/6	7/6	10	10	9/–	—	5 11 3
Traction and Transport							
Anglo-Arg. Trams :							
First Pref. (£5)	4/3	3/3	Nil	Nil	4/–	—	—
4% Inc.	11½	7½	Nil	Nil	11½	—	—
British Electric Traction :							
Def. Ord.	830	600	5	5	625	–120	—
Pref. Ord.	169	147	8	8	165	—	4 17 0
Bristol Trams	48/6	42/–	10	8*	48/3	—	3 6 6
Brazil Traction	12½	9½	$1	50c.	11½	–¾	—
Calcutta Trams	24/–	22/6	8	8	23/6	—	6 16 2
Cape Elec. Trams	18/6	16/–	5	5	18/6	+2/–	5 8 1
Lancs Transport	35/–	28/3	10	10	35/–	—	5 14 8
Mexican Light :							
1st Bonds	33	28	5	5	30½	—	—
Rio 5% Bonds	90	74	5	5	90	—	5 11 1
Southern Rly. :							
5% Prefd.	79	64	5	5	71	+1	7 0 10
5% Pref.	104½	89¾	5	5	100½	+2	4 19 6
T. Tilling	45/9	36/9	10	10	42/–	–6d.	4 15 3
Tilling & B.A.	47/6	43/9	9*	8*	47/6	—	3 7 10
West Riding	35/–	28/6	10	10	33/–	—	6 1 3
Equipment and Manufacturing							
Aron Electricity Ord.	17/6	15/0	15	15	17/6	—	—
Assoc. Elec. :							
Ord.	43/3	37/9	10	10	40/–	—	5 0 0
Pref.	35/3	32/3	8	8	35/–	—	4 11 5
Automatic Telephone & El.	47/3	42/–	12½	12½	45/–	+⅛	5 11 1
Babcock & Wilcox	50/–	42/–	10	12½	46/3	+⅛	5 18 1
British Aluminium Ord.	56/–	48/3	12½	12½	51/3	–2/–	4 17 6
British Insulated Ord.	92/6	78/9	20	20	88/9	+⅛	4 10 1
British Thermostat (5/–)	14/9	11/9	18½	18½	13/3	—	6 19 7
British Vacuum Cleaner (5/-)	12/6	8/6	40	12½	12/6	—	5 0 0
Brush Ord.	4/6	3/–	Nil	Nil	4/6	—	—
Callender's	69/–	59/6	20	15	63/9	—	4 14 4
Chloride Elec. Storage	72/6	68/–	20	15	3⅝	+⅛	4 2 9
Consolidated Signal	72/6	59/–	36½	17	3⅝	+¼	4 13 10
Crabtree (10/–)	24/9	21/–	17½	17½	23/9	—	7 7 4
Crompton Parkinson :							
Ord. (5/–)	20/–	17/–	15	20	17/6	–⅛	5 14 3
E. K. Cole (5/–)	5/–	3/3	10	Nil	4/–	—	—
Elec. & Musical Industries (10/–)	10/3	7/9	5	Nil	9/3	+6d.	—
Electric Construction	36/3	32/6	12½	13½	36/3	—	7 9 2
Enfield Cable Ord.	56/–	46/3	25	16¼	52/6	–⅛	6 3 6
Electrical Switchgear (10/–)	22/6	20/–	16	10	21/3	—	4 14 3
English Electric	33/9	29/6	10	10	31/3	—	6 8 0
Ensign Lamps (5/–)	15/3	13/9	25	25	13/9	—	9 1 10
Ericsson Tel. (5/–)	39/3	33/9	25*	25*	35/–	–⅛	3 11 5
Ever Ready (5/–)	28/3	26/–	30	40	27/6	+9d.	7 5 6
Falk Stadelmann	18/3	17/6	10	6	17/6	—	6 17 4
Ferranti Pref.	25/–	23/–	7	7	25/–	+⅛	5 12 0
G.E.C. :							
Pref.	32/6	28/–	6½	6½	32/–	—	4 1 3
Ord.	83/3	74/3	17½	20	80/–	—	5 0 0
Greenwood & Batley	25/6	16/–	15	10	25/–	—	12 0 0
Hall Telephone (10/–)	18/6	16/3	15	10	16,3	—	6 3 1
Henley's (5/–)	21/6	17/9	20	20	20/–	—	5 0 0
4½% Pref.	21/3	20/6	4½	4½	21/3	—	4 4 8
Hopkinsons	46/9	42/6	12½	15	45/–	—	6 13 4
India-Rubber Pref.	21/–	20/3	5½	5½	20/9	—	5 6 0
Intl. Combustion	121/3	110/–	32½	32½	5¾	+¼	5 13 0
J. Lucas	60/6	53/3	15	15	57/6	—	5 4 5
Johnson & Phillips	50/9	42/3	12½	12½	48/9	–2/–	5 2 6
Lancashire Dynamo	59/9	53/–	25	20	55/–	—	7 5 6
Laurence Scott (5/–)	11/–	9/3	15	15	10/–	–6d.	7 10 0
London Elec. Wire	25/6	25/–	12	7½	25/-xd.	+9d.	6 0 0
Mather & Platt	46/6	36/3	13½	10	38/9	–2/–	5 3 3
Metropolitan Elec. Cable Pf.	22/–	21/3	5½	5½	21/3	—	5 3 6
Murex	86/9	77/6	20	20	80/–	—	5 0 0
Pye Deferred (5/–)	8/9	7/–	25	25	8/9	+3d.	14 5 8
Revo (10/–)	20/9	16/3	17½	17½	16/3	–⅛	10 15 4
Reyrolle	60/6	56/3	12½	12½	57/6	—	4 7 0
Siemens Ord.	23/9	19/6	7½	7½	22/6	—	6 13 4
Strand Elec. (5/–)	2/3	1/9	10	4	2/–	—	8 0 0
S. Smith (1/–)	8/–	7/–	37½	50	7/6	—	6 13 4
Switchgear & Cowans (5/–)	11/9	7/6	20	10	10/–	—	5 5 3
Telegraph Condenser (10/–)	8/9	6/3	5	—	8/9	—	—
Telegraph Construction	42/6	32/6	10	10	37/6	—	5 6 8
Telephone Mfg. (5/–)	9/–	7/9	9	9	9/–	—	5 0 0
Tube Investments	96/9	87/9	23¾	23¾	93/9	+⅛	5 2 6
Vactric (5/–)	3/6	2/–	4	Nil	3/3	–3d.	—
Vickers (10/–)	22/–	16/6	10	10	18/–	+3d.	5 11 1
Ward & Goldstone (5/–)	19/9	19/3	20	20	19/9	—	5 1 3
Westinghouse Brake	46/–	32/9	17½	10	45/–	+⅛	4 9 1
Walsall Conduits (4/–)	26/6	23/9	55	55	26/3xd.	+⅛	8 7 8
West, Allen (5/–)	7/–	5/–	10	7½	5/6	—	5 15 5

* Dividends are paid free of Income Tax.

CONTRACT INFORMATION

Particulars of work for which tenders are invited, contracts placed, and building schemes promising work for electrical contractors and traders

Contracts Open

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses. Further details of items marked with an asterisk can be obtained from the Department of Overseas Trade (Inquiry Room), Great George Street, London, S.W.1.

Blackpool.—May 8th. Electricity Department. Condenser tubes, ferrules and packings. (April 26th.)

Bristol.—May 21st. Corporation. X-ray equipment for Southmead Hospital. (April 26th.)

May 14th. Electricity Department. E.h.v. switchgear, l.v. substation switchgear and transformers. (See this issue.)

Cardiff.—May 20th. Electricity Department. Two 1,000 kVA and four 500 kVA transformers. (See this issue.)

Egypt.—CAIRO.—May 18th. Ministry of Public Health (Municipalities Department). Power station plant comprising two vertical type 90 BHP Diesel engines, complete with accessories, directly coupled to two three-phase, 50-cycle, 75-kVA alternators. Also switchgear, oil pumping set, summation equipment, &c. (T. 18544/40.)*

May 18th. Ministry of Public Works (Mechanical and Electrical Department). Electric motor driven air compressing installation at the Faculty of Science, Giji. (T. 18680/40.)*

Eire.—May 21st. Offaly County Board of Health. Electrically operated pumping machinery for the Edenderry sewerage scheme, comprising two automatic centrifugal pumps with float gear, switches and star-delta starters, and one horizontal type pump directly connected to an electric motor and provided with a hand starter. Nicholas O'Dwyer, consulting engineer, 6, Burlington Road, Dublin (deposit £2 2s.).

Gateshead.—Town Council. Calorifiers and circulating pumps, electric generators and laundry plant at the Sheriff Hill Infectious Diseases and General Hospital Joint Buildings. F. H. Patterson, borough engineer.

Glasgow.—May 13th. Electricity Department. Meters, cable covering tiles and insulating tapes for one year. (April 26th.)

Hastings.—May 27th. Electricity Department. Boiler fuel for period July 1st, 1940, to June 30th, 1941. (April 19th.)

Isle of Wight.—May 28th. County Council. Electrical installation at Whippingham school. S. Gregson, county architect, Newport (deposit £1 1s.).

Manchester.—May 7th. Electricity Committee. 33,000-, 6,600- and 1,000-V cables. (April 26th.)

Morecambe and Heysham.—May 6th. Electricity Department. Two outdoor-type 6,000-kVA transformers with automatic on-load tap-changing gear. (April 19th.)

Morocco.—RABAT.—May 20th. Office of Posts, Telegraphs and Telephones. Telephone rectifying equipment. (T. 18659/40.)*

New Zealand.—WELLINGTON.—May 27th. Posts and Telegraph Department. Six 5-kVA Diesel engine driven generators. (T. 18693/40.)*

May 28th. Textile-covered, lead-sheathed telephone cables. (T. 18695/40.)*

June 25th. Public Works Department. One 11-kV outdoor-type oil-immersed circuit-breaker. (T.Y. 18700/40.)*

New Mills.—May 6th. Electricity Department. One 250-kVA transformer and 10-kV and 660-V cables. (April 19th.)

Portsmouth.—May 9th. Electricity Department. One 1,500-kVA automatic moving-coil voltage regulator. (April 19th.)

Reigate.—May 15th. Cleansing Department. One 44-kW mercury arc rectifier. (See this issue.)

Sheffield.—May 15th. Electricity Department. Two steam shunting locomotives. (April 26th.)

South Africa.—CAPE PROVINCE.—May 29th. Municipality of Upington. Electrically driven pumps. (T. 18756/40.)*

PRETORIA.—May 23rd. Union Tender and Supplies Board. Magnet and p.b.x. switchboards, relay set, mounting plates and shelves. (T. 18813/40.)*

May 16th. Storage battery locomotive. (T. 18974/40.)*

May 30th. Laundry machinery for the Bloemfontein Mental Hospital. (T. 18811/40.)*

Surbiton.—May 11th. Borough Council. Twelve months' supply of electric lamps and fittings. Borough engineer, Council Offices.

West Midlands.—May 10th. Joint Electricity Authority. 6,600-V cables for Bushbury grid substation, Wolverhampton. (April 26th.)

Workington.—May 8th. Electricity Supply Department. 11-kV switchboard. (April 26th.)

Orders Placed

Aberdeen.—Accepted. Savings bank extension: Electrical work and heating. —A. B. Robertson & Son. Electric lift. —Waygood-Otis.

London.—POPLAR.—Electricity Committee. Recommended. Contract renewals for cables for twelve months.—Standard Telephones & Cables; Metropolitan Electric cables; Johnson & Phillips. Telpher bridge for Watts Grove power station (£6,216).—Simon-Carves.

General Purposes Committee. Recommended. Electric baling press (£104).—Edwin Mills & Son.

STOKE NEWINGTON.—Electricity Committee. Recommended. Supply of pressure type, non-pressure type, and combined feed tank and pressure storage heaters, 12- and 15-gallon heavy loading heaters and thermostats, for a further three months from April 1st (prices 15 per cent. above those for previous contract).—Hotric, Ltd.

L.C.C.—Hospitals and Medical Services

Financial Section (*Concluded from page 510*)

Reports and Dividends—contd.

fact that the average price received in 1939 was 1.946d. per kWh as compared with 2.009d. per kWh during 1938. The kWh sold in 1939 increased by approximately 11.3 per cent. over 1938, and the number of consumers had risen by 6.2 per cent.

The company's electrical manufacturing subsidiary has again shown a satisfactory expansion, and the works are at present employed to capacity, largely on orders for Government Departments.

The North Somerset Electric Supply Co., Ltd.—Presiding at the annual meeting held on April 25th Mr. J. H. Woodington (chairman) said that but for the restrictions on lighting imposed at the outbreak of war there was no doubt that the company would have had a record trading year. They had secured a certain amount of new busines, but a decrease in the industrial load was probable within the next twelve months. They had so far not made any alteration in their charges, but if costs continued to rise and they were unable to increase consumption, a rise in prices might be essential.

The London Electric Wire Co. & Smiths, Ltd., reports a net profit for 1939 of £112,508, an increase of £6,737 as compared with the preceding year. General reserve receives £12,500 and special reserve £12,500, and the final ordinary dividend is 5½ per cent., maintaining the distribution at 7½ per cent. The balance carried forward is £87,303 (against £81,100 brought in).

Glenfield & Kennedy, Ltd., are paying a final dividend of 5 per cent., plus a cash bonus of 7½ per cent., making 17½ per cent. for the year. For 1938-39 the dividend was 10 per cent., plus a cash bonus of 10 per cent. The net profit to March 30th was £70,549 (against £104,648).

Hopkinsons, Ltd., in a preliminary statement, report a net profit for 1939-40 of £209,131, as compared with £224,165 for 1938-39. The final dividend is 10 per cent., making 15 per cent., less tax, for the year (same).

Brilliant Signs, Ltd., reports a net profit of £2,286 for 1939, as compared with £15,278 for 1938, to which is added £6,272 brought in. The preference dividend requires £2,430 and tax £3,732. No ordinary dividend is paid (against 10 per cent.), and £2,396 is carried forward.

The Calcutta Electric Supply Corporation, Ltd., reports a net revenue for 1939 of £476,191, as compared with £495,572 for the preceding year. After providing for taxation it is proposed to pay a final ordinary dividend of 4 per cent., making 8 per cent., tax free, for the year (against 10 per cent.), and to carry forward £49,898 (against £51,256 brought in). The sales of electricity totalled 394.6 million kWh, as against 365.1 million for 1938. It is proposed to distribute among the senior members of the staff in India a sum which will not exceed the equivalent of 2 per cent. of the Indian net profit.

Ransomes & Rapier, Ltd., report a net profit for 1939 of £22,503, as compared with £26,282 for the previous year. The final ordinary dividend is 4 per cent., making 6½ per cent., tax free, for the year (against 7½ per cent.), reserve receives £5,000 and £3,537 is carried forward (against £3,758 brought in).

The Pressed Steel Co., Ltd., reports profits for 1939 of £228,440, as against £235,054 for 1938. The final dividend is 17½ per cent., maintaining the distribution for the year at 27½ per cent.

The Ever Ready Co. (Gt. Britain), Ltd., reports that the net profit for the year, subject to audit, is £632,105, as compared with £456,958 for the previous year. The final ordinary dividend is 20 per cent., plus a bonus of 5 per cent., making 40 per cent., less tax, for the year. For the previous year the total dividend was 30 per cent. and there was no bonus. The company states that sales for the year increased by approximately 50 per cent.

The West Devon Electric Supply Co., Ltd., reports a net profit of £23,981 for 1939, as compared with £24,587 for 1938. The ordinary dividend for the year is maintained at 5 per cent., general reserve receives £1,000 and £1,036 is carried forward (against £1,555 brought in).

Walsall Conduits, Ltd., reports a net profit for 1939 of £162,092, as compared with £155,323 for 1938. The final ordinary dividend is 35 per cent., again making 55 per cent., less tax, for the year.

The Marconi International Marine Communication Co., Ltd., has declared a final dividend of 5 per cent., less tax, making 7½ per cent. for 1939. The dividend for 1938 was at the same rate, but in addition a bonus of 2½ per cent. was paid, making the total distribution for the year 10 per cent.

Sydney S. Bird & Sons have deferred consideration of a dividend until the accounts for the year to September 30th are available. Last year there was an interim dividend of 5 per cent. and a final distribution of 7½ per cent., making 12½ per cent., less tax.

S. Smith & Sons (Motor Accessories), Ltd., are paying an interim dividend of 7 per cent. on the 7 per cent. non-cumulative participating preferred shares (same).

Tube Investments, Ltd., is maintaining its interim ordinary dividend at 10 per cent., and at the same rate relatively on the liaison ordinary shares.

The Ebonite Container Co., Ltd., is paying a final dividend of 5 per cent., making 8 per cent. for the year (same), plus a bonus of 6 per cent. (nil).

Committee. Accepted. Electric passenger lift at the Mile End Hospital (£910).—Evans Lifts. Repairs to fuel economiser at the Park Hospital, Hither Green (£758).—Clay Cross Co. Cold storage plant at the Southern Hospital, Dartford (£521).—Kelvinator, Ltd.

Manchester. — Electricity Committee. Recommended. Fibre cable conduits.—Key Engineering Co. 33-W cable.—W. T. Glover & Co. 11-kV cable.—Scottish Cables. One 40,000 kVA three-phase transformer and modifications to two existing 25,000-kVA transformers.—Met.-Vick. Electrical Co. (Revised tender). Spare parts for mechanical stokers at Barton power station.—International Combustion.

Salford.—Electricity Committee. Recommended. Rectifier equipment (£230).—Hewittic Electric Co.

Stoke-on-Trent.—Assistance Committee. Accepted. Cable renewal at London Road Institution (£320).—Callender's.

Contracts in Prospect

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Alloa.—Houses at Whins Road, Moir Street, and Bowhouse (£30,000), for T.C.; burgh surveyor.

Barking.—Factory additions; Isonzo Candy Co., River Road.

Factory additions; A. Ibbetson & Co., River Road.

Bathavon.—Houses (50), Batheaston, for R.D.C.; surveyor, 10, Green Park, Bath.

Birmingham.—Methodist Church in Lyndon Road, Sheldon; T. Wooton, builders, Chester Road, Coleshill.

Bristol.—Senior school on a site at Bedminster Down; city architect.

Burton-on-Trent. — Hotel in Short Street, Stapenhill, for Marston, Thompson & Evershed, Ltd., The Brewery, Shobnall Road, Burton-on-Trent.

Canley.—Sunday schools and church; Rev. F. Guy Morris, chairman, Methodist Conference Committee.

Cardiff.—Works premises and offices, Newport Road, for Connies & Meaden, Ltd., Plymouth Works, Dumballs Road.

Chatham. — Temporary isolation accommodation at County Hospital, for Kent P.A.C.; county architect, Springfield, Maidstone.

Clitheroe.—Extensions to mill; R. D. Blackburn & Sons, Little Moor.

Coventry.—Block of shops in Fleet Street; Bridge, Walker, Ltd., builders, Brixton, S.W.2.

Shops and showrooms, Fleet Street, for Coventry Business Estates, Ltd., 219, Farleigh Road, Warlingham, Croydon, Surrey; Hillier Parker May & Rowden, 27, Maddox Street, London, W.1.

Church at Coundon and extensions to Sunday schools at Lime Tree Park; Methodist Union Committee, Central Circuit.

Houses (19), Benson Road, for R. R. Button, Addison Road, Keresley.

Dagenham.—Factory in Selinas Lane; W. A. Smith & Co., Boleyn Castle, East Ham, E.13.

Devonshire.—Police stations, Torquay and Totnes, for Standing Joint Committee; H. V. de Courcy Hague, county architect, 97, Heavitree Road, Exeter.

Downham Market. — Alterations to pumphouse, and foundations for new drainage plant, Fordham Fen, for Stoke Ferry Drainage Commissioners; O. Borer, engineer, Brooklands Avenue, Cambridge.

Durham.—Nurses' home and medical superintendent's house at School Aycliffe Mental Colony for the C.C.; Rees and Holt, architects, 64, Rodney Street, Liverpool.

Additions to P.A.C. offices for the C.C. (£2,000); W. J. Merrett, county surveyor, 43, Old Elvet, Durham.

Ealing. — Church, Horsenden Lane North, for Parochial Church Council; C. A. Farey, architect, Prince Albert Road, Regent's Park, N.W.8.

Extensions to factory for Supak Manufacturing Co., Aintree Road; Worboys & Sons, contractors, 4, London Road, Wembley.

Eire.—CORK.—Houses (210), Greenmount, for T.C.; J. R. Boyd Barrett, architect, 61, South Mall, Cork.

Block of shops, &c., Gurranabraher; J. R. Boyd Barrett.

LIMERICK.—Regional hospital scheme, for T.C.; P. J. Sheahan, architect.

LOUTH.—Works at Ardee Mental Hospital (£30,000); J. F. McGahon, architect, 9 and 18, Exchange Buildings, Dundalk.

Edinburgh.—Offices and showrooms (£60,000), Lothian House, Toll Cross, for Town and Country Estates, Ltd.; Stewart, Kaye and Walls, architects, 14, Hill Street.

Erpingham. — Houses at Sustead, Northrepps and Southrepps, for R.D.C.; surveyor, Council Offices, St. Peters Road, Sheringham.

Evesham.—Waterworks (£17,000); borough engineer.

Fenton (STAFFS).—Factory additions, Victoria Road; T. Byatt, Ltd.

Foleshill.—Chapel in Lockhurst Lane; Methodist Union trustees

Glasgow.—Additions to works, Cogan Street; G. Cohen, Sons, & Co., Ltd.

Gloucestershire.—Engineering block at "The Woodlands," Cheltenham, for the County Education Committee; Ashley & Winton, architects, 14, Gray's Inn Square, London, W.C.1.

Guildford.—Factory additions, By-Pass Road, for the Warner Engineering Co.; Leslie Hiscock, architect, Maori Road, Guildford.

Hinckley.—Male ward (£8,000), Hinckley and District Hospital; Pick, Everard, Keay and Gimson, architects, Leicester.

Hucknall.—Fire station, Derbyshire Lane, for U.D.C.; H. M. Aitchison, surveyor, Council Offices.

Huntingdonshire. — Police station (£6,500), Fletton, for Hunts Standing Joint Committee; T. H. Longstaff, county architect, Walden House, Huntingdon.

Isle of Wight.—New boiler house and other works, Whippingham School, for E.C.; S. Gregson, county architect, County Hall, Newport.

Jarrow-on-Tyne.—Houses, Low Simonside estate; J. S. Weir, borough engineer.

Kingsclere and Whitchurch.—Houses (20), Ashmansworth, Ecchinswell, and Headley; Clerk's Office, Swan Street, Kingsclere.

Kirkham (LANCS).—Sewage works (£26,621); U.D.C. surveyor.

Kirriemuir.—Houses, Middlefield and Knowehead; burgh surveyor, Town Hall.

Leicester. — Accommodation at City General Hospital for 600 patients, together with staff quarters, kitchens, &c.; city architect.

Lincoln.—Extensions, including operating unit, X-ray and out-patient departments, at Lincoln County Hospital (£40,000); secretary.

London.—SOUTHFIELDS. — Factory extensions, 310, Merton Road, S.W.18, for Simmonds & Stokes, Ltd.; J. Rider Hunt & Co., architects, 181, Queen Victoria Street, E.C.4.

Macclesfield.—Development of Collar House estate, Poynton; Cordingley and McIntyre, architects, 195, Oxford Road, Manchester.

Manchester.—Accommodation, Baguley sanatorium; city architect.

Sewage works; city engineer, Town Hall, Manchester, 2.

Rehousing schemes (£168,000); city architect.

Factory for C. H. Johnson & Son, Smedley Lane, Cheetham; J. H. Sellers, architect, 78, King Street.

Melford.—Flax factory, Glemsford station; A. E. Wiseman, architect, Chelmsford.

Mexborough.—Alterations to kitchens and dining rooms at Montague Hospital, Adwick Road; D. W. Harrop, architect, 31, Bank Street.

Middlesbrough.—Inquiry for site for paint factory received by Tees Development Board, North-Eastern Bank Chambers.

Newcastle-on-Tyne.—Alterations at the Phœnix mills; J. O. C. Solomon, city property surveyor, Town Hall.

Newquay. — Pavilion, East Street; U.D.C. surveyor.

Northern Ireland.—BELFAST. — Textile factory, Donegall Street, for Bradford Dyers' Association, Ltd., Well Street, Bradford.

ARMAGH.—Large canning factory, for Wisbech Produce Canners, Ltd., London; C. W. Smedley, managing director.

North Kesteven.—Houses for agricultural workers; surveyor, Council Offices, Clasket Gate, Lincoln.

Northwich.—School; W. Forster & Son, contractors, Moss Road, Castle, Northwich.

Norwich.—Workshop block, technical college (£31,994); borough surveyor.

Nottinghamshire.—Administrative and clinical blocks and staff accommodation, Ransom Sanatorium (£49,000), and hostel and cottages in form of village settlement; E. W. Roberts, county architect, Nottingham.

Peterborough.—Additional pumping station, Etton waterworks, Glinton, for the T.C.; Jennings Builders, Ltd., contractors, Walpole Street, Westwood Bridge, Peterborough.

Plymouth. — Social centre, bathing station, &c. (£37,000); borough engineer.

Rowley Regis.—Fire station buildings on site at Old Hill; Surveyor, Council House.

Sheffield.—Church, Barnsley Road, for Rev. R. Roseveare, The Priory, Parson's Estate; W. G. Robson, Ltd., Bamforth Street, Owlerton, Sheffield, 6.

School buildings at Meynell Road, Fox Hill and Lindsay Road; W. George Davies, city architect, Town Hall.

Southwell. — Houses (£10,926), for R.D.C.; clerk, 8, Westgate, Southwell, Notts.

Staffordshire.—Proposed new technical college for Brierley Hill and Stourbridge; K. L. Murray, county architect, County Buildings, Stafford.

Stoke-on-Trent.—Houses for Owen & Co., Station Green, Milton.

Additions to Carlton Works, Copeland Street, for Wiltshaw & Robinson, Ltd.; Sambrook Bros., Ltd., contractors, Hamil Road, Burslem.

Buildings at North Staffordshire Royal Infirmary, Princes Road, Harthill; Stephen Heath & Son, contractors, Brunswick Street, Newcastle-under-Lyme.

Sutton and Cheam. — Central fire station; borough engineer, Municipal Offices, High Street, Sutton.

Swansea.—Grammar school, Sketty; borough engineer.

Tottenham. — Factory, Farningham Road; Radiamp Co., Ltd.

Factory reconstruction, Ferry Lane; A. & W. Flatau & Co., Ltd.

Factory extensions, Lawrence Road; Cronite Foundry Co., Ltd.

West Lancashire.—Fire station, Old Racecourse Road, Maghull, and houses for farm workers in rural districts; R. Rosbotham, surveyor, West Lancashire R.D.C., 52, Derby Street, Ormskirk.

Wiltshire.—Extensions and alterations (£11,709), Calne Senior School, for E.C.; county architect, County Offices, Trowbridge.

Wokingham.—Pumping stations and sewage disposal works, for R.D.C.; Howard Humphreys & Sons, engineers, 17, Victoria Street, Westminster, S.W.1.

Wolverhampton.—Additions, Alustar works, Marston Road, for Star Aluminium Co., Ltd.

COMING EVENTS

May 7th (Tuesday).

Illuminating Engineering Society.—St. Ermin's Hotel, Westminster. 1 p.m. Informal luncheon. Lighting Service Bureau, London, W.C.2. 5.30 for 6 p.m. Annual general meeting.

May 8th (Wednesday).

I.E.E. (*Transmission Section*).—Institution, London, W.C.2. 6 p.m. "Mechanical Integrity in the Design of Electrical Circuit-Breakers." By M. C. Hunter.

May 9th (Thursday).

I.E.E.—Institution, London, W.C.2. 6 p.m. Annual general meeting.

Association of Mining Electrical Engineers (*South Wales Branch*).—Annual general meeting. Visit in the afternoon to the G.E.C. new showrooms in Kingsway, Cardiff.